

Mapping AHRQ's 30-Year Investment in Primary Care Research (1990-2020)



**MAPPING AHRQ'S 30-YEAR INVESTMENTS IN PRIMARY CARE RESEARCH
(1990-2020)**

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

Agency for Healthcare Research and Quality 5600 Fishers Lane Rockville, MD 20857

www.ahrq.gov

AHRQ Publication No. 24-0016

January 2024



This document is in the public domain and may be used and reprinted without permission.
This document does not represent the official views of AHRQ.

Citation of the source is appreciated. Suggested Citation: Rockwell M., Holtrop J, Eden A, McNellis R, Leal A, Bierman A, Kato E. Mapping AHRQ's 30-Year Investment in Primary Care Research (1990-2020). Rockville, MD: Agency for Healthcare Research and Quality; January 2024. AHRQ Pub. No. 24-0016.

ACKNOWLEDGEMENTS

The authors would like to thank the following current and former AHRQ staff for their support and critical review of this report: Dr. Therese Miller, Constance Owens, Jan Delamare, Dr. Sebastian Tong, Dr. Matt Simpson, Gail Makulowich, and Caryn McManus.

We offer special thanks to everyone who contributed to the content of this report by sharing their firsthand knowledge of these programs and historical context. These are the visionaries and luminaries of primary care research at AHRQ. This report is a testament to their work over the past 30 years that made AHRQ's primary care research as rich as it is: Dr. Jeff Brady, Dr. Helen Burstin, Dr. Carolyn Clancy, Dr. Ben Crabtree, Dr. Melinda Davis, Dr. David Lanier, Dr. Ed Lomotan, Dr. Paul Nutting, Rebecca Roper, and importantly the late Dr. David Meyers, whose vision and passion for primary care research is the soul of this report.

Contents

INTRODUCTION..... 1

METHODS..... 4

 Categorization of Research Investments 4

 Research Impact..... 7

 Limitations..... 8

RESULTS 9

 FOUNDATIONAL THEMES IN AHRQ’S PRIMARY CARE RESEARCH: INFRASTRUCTURE, METHODS, AND DATA 10

 Research Infrastructure 10

 Methods for Primary Care Research..... 14

 Data for Primary Care Research..... 16

 TOPICS IN PRIMARY CARE RESEARCH 17

 Organization of Care 17

 Care Coordination 17

 Team-Based Care 19

 Care Management 22

 Patient-Centered Medical Home (PCMH)..... 23

 Integrating Behavioral Health with Primary Care 27

 Multiple Chronic Conditions (MCC) 29

 QUALITY 31

 Practice Facilitation..... 31

 Improving Equity in Primary Care 34

 The Effective Healthcare Program 34

 Person-Centered Care..... 35

 Shared Decision Making..... 36

 SAFETY..... 37

 Medication Safety 38

 Comprehensive Unit-Based Safety Program (CUSP)..... 39

 Care Transitions 39

 TeamSTEPPS® 40

 PRIMARY CARE WORKFORCE 40

Describing the Workforce	40
Expanding the Workforce	41
Re-Configuring the Workforce	41
Sustaining the Workforce	42
DIGITAL HEALTHCARE	43
Telehealth	45
Electronic Health Records	47
Clinical Decision Support.....	49
Health Information Exchange	51
FINANCING AND COST	52
PREVENTION	52
SUMMARY	56
REFERENCES	58
Appendix A. Grants Database Search Terms & Analytic Categories/Definitions used in Portfolio Analysis 2008-2019	72
Search Terms.....	72
Setting	72
Workforce	72
Variables.....	72
Populations	73
Age Studied	73
Coverage	73
Race/ethnicity	73
Vulnerable populations.....	73
Geography.....	73
Medical Conditions studied	73
Chronic Disease.....	73
MCC.....	74
Mental/behavioral health	74
Cancer	74
Infectious Disease	74
Women’s Health Issues.....	74
Prevention.....	74

Healthcare Themes	74
Clinical Decision-making	74
Medication management and adherence	74
PHC transformation	74
Care Management	74
Cost or Payment Schema	75
Primary Care Models.....	75
PBRN	75
Quality Improvement.....	75
Leveraging HIT.....	75
Dissemination and Implementation	75
Appendix B. Timeline: Examples of AHRQ’s Primary Care Research Investments	76

INTRODUCTION

The National Academy of Medicine (NAM, formerly known as the Institute of Medicine or IOM) defines primary care as “the provision of integrated, accessible healthcare services by clinicians who are accountable for addressing a large majority of personal health care needs, developing a sustained partnership with patients, and practicing in the context of family and community.”¹ NAM published an updated definition of primary care in 2021 that reaffirms its 1996 definition and incorporates concepts of whole-person and equitable care delivered by interprofessional teams to improve health and wellness.² Primary care is a function, not simply a discipline, specialty, or service line in which comprehensive, continuous, coordinated, first-contact care is provided to patients of all ages, backgrounds, and socioeconomic circumstances.^{1,3} A well-functioning primary care system is foundational to achieving the important aims of healthcare: improved health outcomes, reduced costs, enhanced patient and clinician experience, and health equity. Yet, primary care in the United States faces many challenges, including increased clinician demands and expectations, patients with increasing medical complexity, a clinician shortage, and payment models that are often inadequate. The COVID-19 pandemic has further exposed vulnerabilities and remains a threat to the future of primary care.

The purpose of primary care research is to better understand and improve the design, function, delivery, and outcomes of primary care. Primary care research has been and will continue to be critical if primary care is to evolve and thrive. As the designated federal agency to lead primary care research, the Agency for Healthcare Research and Quality (AHRQ) has been committed for the past 30 years to conducting and supporting primary care research and working to ensure that primary care research findings are understood and integrated into practice. In 1990, AHRQ (in its previous incarnation as AHCPR—Agency for Healthcare Policy and Research) sponsored a national conference entitled *Primary Care Research: An Agenda for the 90's*, which produced a summary report and primary care research agenda centered on the patient, the practitioner, the problem, and the clinical process of care as they exist and interact with the social structure, the community, practice or program, and healthcare system.⁴ This agenda specifically defined research needs related to the organization of primary care, evolving financial models for primary care, care for patients with complex medical presentations, and equitable primary care for all Americans. The need for the training and professional development of primary care researchers was also emphasized (Table 1).

Table 1. 1990 Primary Care Research Agenda

AHCPR’s first primary care research agenda organized research questions into eight areas:	
• The patient	• The social structure
• The practitioner	• The community
• The problem	• The practice or program
• Clinical process of care	• The healthcare system
The ninth area of interest involved development of research methods for primary care.	

Despite name changes and restructuring, the Agency has consistently invested in primary care research since 1990. Under the Omnibus Budget Reconciliation Act ([H.R. 3299, section 6103](#)), AHRQ’s predecessor, ACHPR (1989-1999), quickly established an agenda to conduct and support primary care and practice-oriented research through the Division of Primary Care within the Center for General Health Services Extramural Research. Ten years later, upon congressional passing of the [Healthcare Research and Quality Act](#), AHCPR was renamed AHRQ and specifically designated as the lead federal agency for primary care research and mandated to house a center for primary care research. From 1999-2014, primary care research was housed in the Center for Primary Care, Prevention, and Clinical Partnerships (CP3). Then in 2014, CP3 was merged with the Center for Outcomes and Evidence to form the Center for Evidence and Practice Improvement (CEPI) and a formal National Center for Excellence in Primary Care Research (NCEPCR) was established within CEPI (Figure 1).

Figure 1. Evolution of Primary Care Research at the Agency

	1989-1999		1999-present	
Agency Name	 Agency for Healthcare Policy & Research		 Agency for Healthcare Research and Quality	
Locus of Primary Care Research	1989-1999	1999-2014	2014-present	
	Division of Primary Care	Center for Primary Care, Prevention, & Clinical Partnerships (CP3)	 NATIONAL CENTER FOR EXCELLENCE IN PRIMARY CARE RESEARCH	

Thirty years following the initial primary care research conference, AHRQ convened a second national conference to develop a primary care research agenda for the 2020s and beyond. As part of this process, AHRQ conducted a review of the Agency’s 30-year commitment to advancing the science of primary care delivery, specifically taking stock of the many impacts achieved along the way. This report describes AHRQ’s investment in primary care research over three decades, from 1990-2020, and discusses how that research has impacted the field of primary care.

METHODS

This report is a descriptive review based on seminal publications, targeted literature searches, project documents, federal databases, and a limited number of key informant interviews. The primary purpose is to describe AHRQ's investments in primary care research between 1990 and 2020; it is not intended as a comprehensive catalog of the Agency's entire portfolio or a systematic evaluation of impact. The report uses the following definitions:

Primary Care- the provision of integrated, accessible healthcare services by clinicians who are accountable for addressing a large majority of personal healthcare needs, developing a sustained partnership with patients, and practicing in the context of family and community.¹

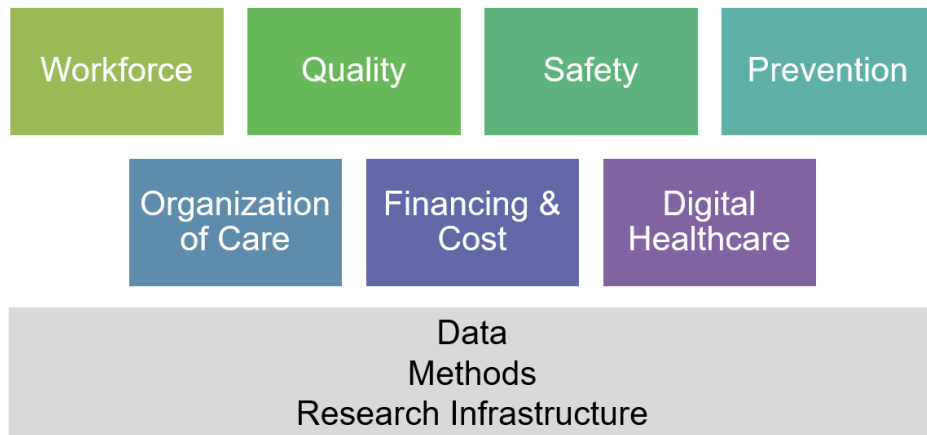
Primary Care Research- research conducted for the purpose of better understanding or improving primary care; more specifically, a) research that is conducted in a primary care setting, b) by or about primary care clinicians, or c) on a topic that is integral to primary care.

Agency- refers to the Agency for Healthcare Policy and Research (AHCPR) or the Agency for Healthcare Research and Quality (AHRQ)

Categorization of Research Investments

The first step in this review was to identify a set of thematic categories for organizing AHRQ investments in primary care research, 1990-2020. The purpose of the categories is to describe AHRQ's contributions to primary care research to date rather than as a definitive description of primary care research or the field of primary care as a whole. Furthermore, it was recognized that many if not most AHRQ work cuts across categories. Therefore, projects are described under the theme that seemed most appropriate and may appear in more than one section of this paper. These thematic categories were developed based on a targeted review of seminal primary care research publications, key internal AHRQ program documents and reports (including an unpublished 2019 portfolio review of primary care grants—see Appendix A for a description of the analytic approach), and dialogue with the National Center for Excellence in Primary Care Research (NCEPCR) team at AHRQ. Based on this review, AHRQ investments were grouped into three areas of primary care research capacity development and seven topics of primary care research (Figure 2).

**Figure 2. Thematic Categories in AHRQ’s Primary Care Research Investments (1990-2020):
Topics for Primary Care Research and Areas for Capacity Development**



The three areas of primary care research capacity development included: 1) research infrastructure, 2) research methods, and 3) primary care data. The seven topics included: 1) organization of care, 2) quality, 3) safety, 4) primary care workforce, 5) financing and cost of care, 6) digital healthcare, 7) prevention. Definitions of these can be found in Table 2.

Table 2. Definitions for Thematic Categories in AHRQ’s Primary Care Research Investments (1990-2020): Topics for Primary Care Research and Capacity Development

THEME	DEFINITION
Developing Capacity for Primary Care Research	
Research Infrastructure	Investments to build or improve the capacity to carry out primary care research, including training researchers and developing and supporting programs and institutions designed to encourage and support primary care research.
Research Methods	Investments to develop, improve, and disseminate methodology, strategies, processes, and techniques used to conduct primary care research.
Primary Care Data	Data and analytics that describe primary care or that are used in primary care research and practice.
Topics in Primary Care Research	
Organization of Care	Research focused on the organization, structure, or routines of primary care service delivery, including Care Coordination (both team-based care and care management), the Patient Centered Medical Home (PCMH), integration of behavioral health and primary care, and management of Multiple Chronic Conditions (MCC).
Quality	Research to assess the equitability, effectiveness, accessibility, and person-centeredness of primary care, including the outcomes of primary care.
Safety	Research includes errors, potential harms, and unintended consequences experienced in primary care.
Primary Care Workforce	Research focused on primary care clinicians, including number and descriptive characteristics; training, recruitment, and retention; performance and morale; and experience and viewpoints.
Financing and Cost	Research to assess payment structure and mechanisms, costs and expenditures, and value as related to primary care service access and utilization.
Digital Healthcare	Research focused on the digital healthcare ecosystem and its relationship to primary care, including electronic health records (EHRs), the use of mobile devices, and telehealth.
Prevention	Research focused on preventing disease, maximizing health, and steps to conduct these functions in primary care.

The second step was to develop an inventory of AHRQ’s primary care grants, contracts, and intramural projects using the following strategies:

- Automated search of the National Institutes of Health (NIH) Office of Portfolio Analysis (OPA) QVR and iSearch databases for grants funded by AHRQ between FY 2008 and 2019 (the full date range for which this database was available), followed by an abstract review to determine alignment with the definition of primary care research (EK, AL) (Appendix A). Descriptive statistics were used for analysis.
- Examination of seminal primary care research publications and key AHRQ program documents and reports from 1990 to 2020, including a review of the NCEPCR website and NCEPCR program documents.

- Semi-structured interviews with 12 key informants (internal and external to AHRQ) purposefully selected to include individuals with unique knowledge of AHRQ’s past or present contributions to primary care research.

Investments identified through these steps were compiled in a database and organized by thematic category and are described in the Results section. Because of time and space constraints, this report focuses on larger projects, although some investigator-initiated grants that had notable impact or addressed important topics are also included.

Research Impact

“[Health services research] impact is rarely immediate, nor does it necessarily unfold in a direct and linear fashion whereby one article leads quickly to one important change in health outcomes.”⁵

- John Eisenburg, MD, AHRQ Director (1997-2002)

Performing a rigorous evaluation or analysis of 30 years of investment in primary care research was beyond the scope, not to mention the timeframe and budget, of this report. Instead, we developed a functional rubric, based on a number of published frameworks for evaluating impact,⁵⁻¹² and used it to identify examples of impact mentioned in the literature review and interviews.

AHRQ’s investments in primary care research can be said to have impact if they led to:



Knowledge that shaped thinking about the field and/or spurred further **Research**



Tools, resources, or models for practice that led to changes or improvement in **Programs and Clinical Practice**



Improvement in **Health Outcomes**



Data or research conclusions that influenced **Policy**

Examples of project impacts were identified through review of key informant and stakeholder interview notes, research publications, and program documents. In addition, quotes from RAND's *Health Services and Primary Care Research Study* appear throughout the report. Peter Mendel, Senior Sociologist with the RAND Corporation, generously allowed AHRQ to access de-identified quotes obtained during RAND's work on the *Health Services and Primary Care Research Study*.⁹ however, any analysis, summary, or choice of quotes from those data in the report were conducted by AHRQ staff and do not reflect the opinions of RAND.

Limitations

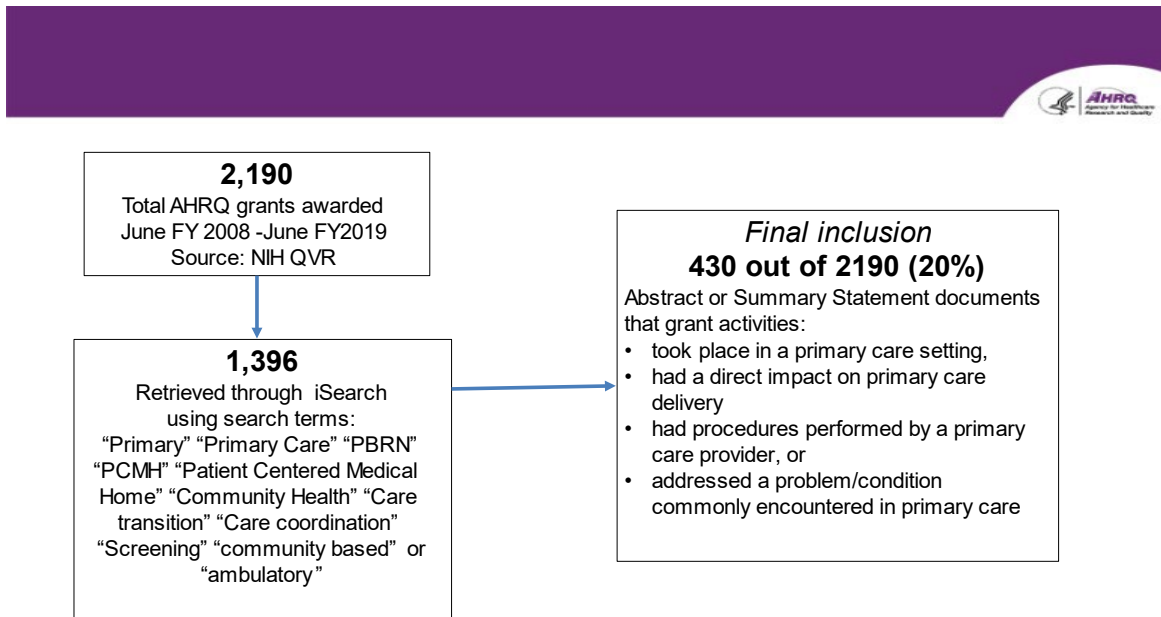
As noted, the purpose of this report is to provide an overview of AHRQ's investments in primary care research over the past 30 years, highlighting notable programs and impacts. It is not intended to be a comprehensive list of AHRQ's work in the field of primary care research nor, due to time and resource constraints, is it a systematic evaluation. We hope this report will serve as a roadmap to AHRQ's role in primary care research over time, ground discussions on a new agenda for primary care research, and serve as a starting point for more rigorous assessment.

RESULTS

Agency investments in primary care research between 1990 and 2020 took the form of grants, contracts, and intramural projects to develop tools, conduct research, and develop conceptual frameworks and research agendas. Grant investments included Agency-directed Requests for Application (RFAs) and investigator-initiated grants, and covered a wide range of grant types: R01 (large research project), R03 (small research project), R18 (demonstration and dissemination), R21 (exploratory/developmental research), R24 (resource-related research project), R36 (research dissertation program), R13 (conference grant), U grants (cooperative agreements), P grants (research program project grants, exploratory grants, center core grants), K grants (new investigator grants), and F grants (individual fellowships). Between 2008 and 2019, 29% of all primary care research awards went to R18s, 19% to R01s, and 10% to R03s.

The primary care research grant investments from 2008-2019 totaled approximately \$218 million and crossed the lifespan and continuum of primary care, represented diversity in populations, including minority and priority populations, and involved many different regions of the country. From fiscal year 2008 through 2019, AHRQ funded 430 primary care research grants out of 2,190 grants awarded over this time period. Thus, almost 20% of all funded AHRQ grants were primary care research (Figure 3).

Figure 3. Primary Care Grants Identified 2008-2019



6

Data on primary care research contracts and intramural research were more difficult to tease out due to the variety of mechanisms and funding sources over time, but contracts for primary care research awarded through the ACTION network alone totaled more than \$22 million between 2009 and 2019.

FOUNDATIONAL THEMES IN AHRQ'S PRIMARY CARE RESEARCH: INFRASTRUCTURE, METHODS, AND DATA

Over 30 years, AHRQ has worked to build the national capacity to conduct primary care research through building the human and institutional infrastructure needed for primary care research, advancing the methodology of primary care research, and creating data resources to describe and measure primary care.

Research Infrastructure

Nurturing a Cadre of Primary Care Researchers

Ensuring a supply of well-trained primary care researchers was part of AHCPR's first primary care research agenda⁴. Paul Nutting, the first Director of the Division of Primary Care for AHCPR, described

the Agency’s early commitment to developing primary care researchers with specific expertise in health services research, a relatively new field in the 1990’s – “primary care research to this point focused on clinical studies – what treatment works for different problems – but we saw the greatest need for building researchers who were focused on service delivery in the context of healthcare practice.” The IOM echoed the need for developing and nurturing primary care-focused health service researchers in their 1996 report, *Primary Care: America’s Health in a New Era*, explaining that the need for such researchers had “outstripped the current supply.”¹

To meet this need, AHCPR established a task force to build capacity for research in primary care in the early 1990’s,¹³ which led to ACHPR funding for education and training for primary care clinicians and researchers in skills such as institutional review board (IRB) submissions, grant writing, research design, methodology, and analysis.¹⁴ AHRQ has continued to fund numerous visiting scholar positions, research sabbaticals, new investigator awards, student and training grants, and training programs, including 34 F and K awards between 2008 and 2019.

ACHPR/AHRQ also supported numerous conferences and workshops where primary care researchers could network, collaborate, and disseminate their work to move the field forward. Examples of primary care research conferences supported by AHRQ in the past ten years include: the *North American Primary Care Research Group Annual Meeting*, *Working Conference Series to Disseminate Patient Centered Medical Home Implementation Strategies*; *Primary Care, Prevention and Screening Research for People with Intellectual Disabilities*; *Integrated Care for Asian Americans, Native Hawaiians, and Pacific Islanders: Making Research Work to Improve our Health*; multiple practice-based research conferences, and the [30th Anniversary Primary Care Research Conference](#) held in December, 2020.

AHRQ’s direct and indirect support of these conferences and workshops was vital. Primary care researcher and medical anthropologist, Benjamin Crabtree, from Rutgers Robert Wood Johnson Medical School, explained that “scores of primary care researchers got their start with AHRQ, grew up with AHRQ, and flourish thanks to the support of AHRQ.” He, for example, received an AHRQ R13 conference grant to support a *Methodological Think Tank*¹⁵ held in conjunction with the annual AHRQ-funded *Primary Care Research Methods & Statistics Conference* in 1993. This *Think Tank* led to the publication of a book: *Exploring Collaborative Research in Primary Care*.¹⁶ Dr. Crabtree went on to receive additional funding from AHRQ, NIH, the Robert Wood Johnson Foundation, and others for primary care research. He worked with ESCALATES, the national evaluation of AHRQ’s EvidenceNOW: Advancing Heart Health initiative.¹⁷

Connecting Practitioners and Researchers: The Practice-Based Research Networks

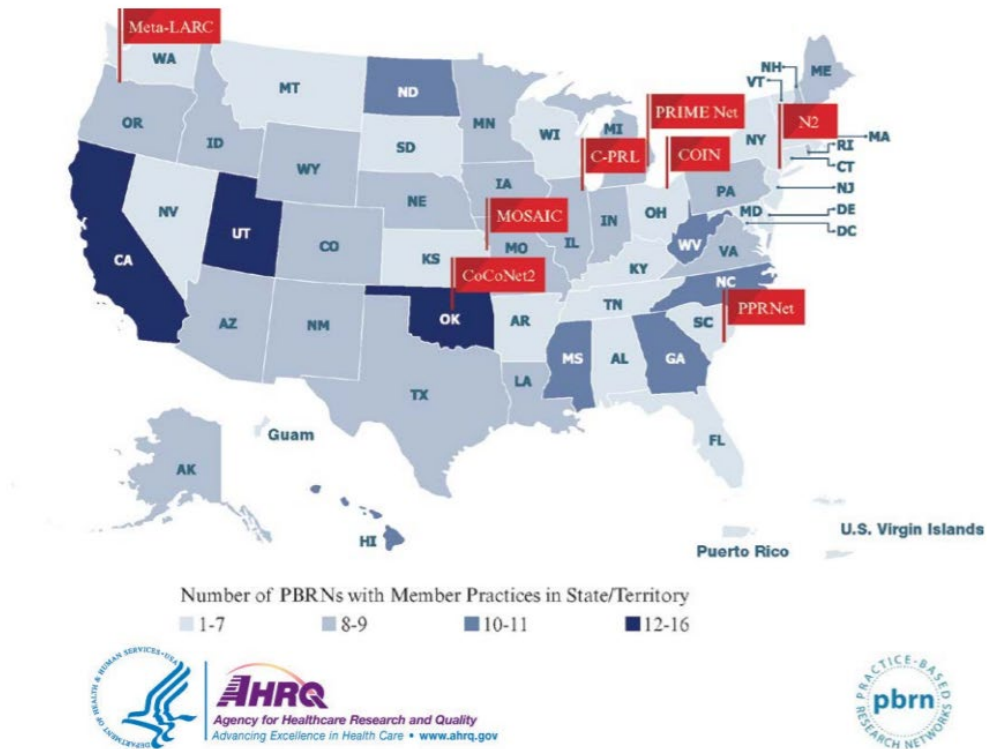
In addition to training and supporting primary care researchers, AHRQ has played an important role in primary care practitioners and researchers. In 1997, Lanier and Clancy¹³ emphasized the “pressing need for sustainable infrastructures that link practitioners and researchers in an effective fashion.” They also hypothesized that involving multiple clinical sites in research would lead to more generalizable research that takes less time from conceptualization to publication. AHRQ’s work to develop and support the Practice-Based Research Networks (PBRNs) helped put this vision into practice for primary care research.

PBRNs are groups of ambulatory practices devoted principally to the primary care of patients and affiliated in their mission to investigate questions related to community-based practice and to improve the quality of primary care. Put simply, they are “clinical laboratories for primary care research and dissemination.”¹⁸ The history of PBRNs in the U.S. dates to the 1970’s, when two regional PBRNs were formed: the Cooperative Information Project and the Family Medicine Information System in Colorado.¹⁹ PBRNs gained in number and productivity throughout the 1980’s and 1990’s, and were recognized by the IOM as “a significant underpinning for studies in primary care.”¹ Despite this recognition of their importance, PBRNs struggled to get resources. At a time when funding for PBRN work was hard to come by, AHCPR sponsored approximately ten PBRN research studies prior to 2000, including the Child Abuse Reporting Experience Study (CARES) (R01, PI: E. Flaherty)²⁰ and [early work](#) related to medical errors and telephone care for Medicare patients.

The Agency’s role in PBRNs expanded after 2000, when David Lanier, then part of the Center for Primary Care at ACHPR, made the case for expanding opportunities for primary care PBRNs.²¹ In response, ACHPR released a funding request for PBRN planning grants, for which more than 100 applications were received and [19 were funded](#). Dr. Lanier describes the response as “amazing and overwhelming” and the impact as “galvanizing the primary care community.” [Between 2000 and 2010](#), AHRQ funded six competitive grant series and more than 40 contracts specific to PBRN work (totaling more than \$20 million). PBRNs also received support through other AHRQ investments (e.g., health IT grants, American Recovery and Reinvestment Act). In 2012, AHRQ launched an initiative to support eight collaborative centers for primary care practice-based research through five-year P30 program grants. These centers, which came to be known as the [Centers for Primary Care Practice-Based Research and Learning](#), were comprised of multiple PBRNs with at least 120 member practices each (Figure 4).

AHRQ also began funding an annual *PBRN International Conference* where members could meet to share ideas and research, network, and learn from one another.

Figure 4. The Centers for Primary Care Practice-Based Research and Learning



Sustained funding of the PBRNs and the *Centers* allowed a surge of activity in frontline primary care research, methods, and tools, such as:

- Creation of a national [*Practice Facilitator Professional Development and Training Program*](#) and [*Practice Facilitation Handbook*](#) that was instrumental in Patient-Centered Medical Home (PCMH) transformation and continues to be used broadly for primary care quality improvement.
- Establishment of the [*National Center for Pediatric Practice-Based Research and Learning*](#) focused on improving delivery of and learning from pediatric primary care throughout the U.S. and training of junior primary care researchers.

- Adaptation and evaluation of research methodology to primary care in areas such as community-led [patient-centered outcomes research](#), quality improvement,²² rapid cycle research, clinical trials,²³ the RE-AIM (reach, effectiveness, adoption, implementation, maintenance) framework, the *Pragmatic-Explanatory Continuum Indicator Summary (PRECIS)*,^{24,25} *Clinical Inquiries (Clin-IQ)* [PBRN best practices](#).²⁶⁻²⁸
- Training researchers to conduct primary care research in PBRNs through a [certificate program in practice-based research methods](#).
- Innovative use of digital healthcare in research and clinical practice; for example, development of an electronic health record (EHR) functionality and structure to improve care to [pediatric patients](#), and the impact of digital healthcare on practice performance²⁹ and patient safety.³⁰
- Numerous continuing education opportunities for clinicians, including conferences, workshops, webinars/seminars, and more than 750 online CME courses.

Despite stepping back from direct funding due to budget limitations, as of July, 2020, AHRQ continues to host [PBRN resources](#), a [PBRN Registry](#), and fund the annual *PBRN International Conference*.³¹ PBRNs have fostered the culture of applied, practice-based health services research throughout the primary care system.¹⁹ PBRN pioneers, Larry A. Green and John Hickner, wrote that “it would be difficult to overstate the importance of AHRQ in the maturation of practice-based research in the United States.”¹⁹ This culture, and the skills and relationships that support it, placed PBRNs at the center of many local responses to COVID-19, providing telemedicine resources, community health center support, and learning communities related to the pandemic.^{32,33} It has been estimated that one third of Americans are reached by at least one PBRN.³⁴

Methods for Primary Care Research

To conduct high-quality research that impacts primary care, appropriate research methods must be available and utilized correctly. To that end, AHRQ has contributed to the development and use of research methods that have accommodated that goal. Here are some ways AHRQ has enhanced research methods.

First, AHRQ staff remains up to date on new and emerging research methods and has encouraged the use of specific methods in their calls for proposals. This has facilitated the application of research methods in

AHRQ-funded studies adding to the evidence base. Some examples include the importance of stakeholder engagement methods in research (RFA-HS-19-002 Using Data Analytics to Support Primary Care and Community Interventions to Improve Chronic Disease Prevention and Management and Population Health) or innovative study designs (RFA-HS-14-008 Accelerating the Dissemination and Implementation of PCOR Findings into Primary Care Practice).

Second, AHRQ has invested in the development of new methods and has curated reports outlining methods recommendations. For example, in the [Effective Healthcare Programs](#), guidance can be found on use of methods.

Third, AHRQ has provided methods [training in the form of webinars](#) on specific research methods, as well as [resources](#) for methods information including reports and tools. Additionally, AHRQ has funded conference grants that have furthered primary care methods, such as the San Antonio Primary Care Research Methods and Statistics Conference that ran for from 1995 through 2005 and the more recent Colorado Pragmatic Research and Health Conference (2020).

Related to methods is the development of metrics and measures in which to determine the success of primary care research on important outcomes. In addition to the data sources, measures have included development and support for the CAHPS surveys, which are endorsed by the National Committee for Quality Assurance (NCQA). These surveys have been used to design quality improvement initiatives in more than 300 research studies, and informed the development of other patient-focused surveys. Two examples include studies to assess survey response rate when patients are offered the possibility of a small monetary reward³⁵ or are presented with web-based vs. print surveys.³⁶ Cultural differences in responses to care scenarios and sample vignettes were also evaluated.³⁷ Other examples include the *COMputerized Needs-oriented QUality measurement Evaluation SysTem* (CONQUEST 2.0) and the Quality Measures project (Q-Span). These were early (1990's) quality improvement software tools that aimed to promote clinical performance measurement standardization in primary care and other settings.^{14,}

38

The Informed Consent and Authorization Toolkit for Minimal Risk Research toolkit helps both researchers and institutional review boards ensure that potential subjects can make well-informed decisions about participating in research studies. The Toolkit includes model process for obtaining written consent and authorization, sample easy-to-read consent documents for informed consent and authorization, and a certification tool to promote the quality of the consent process.

“I think of the Alternative Quality Contract in Massachusetts... was possible because of a variety of different AHRQ-funded research on quality metrics, capitation payments, global payments, pay-for-performance. You know, these components end up allowing the design of potentially game-changing delivery system innovations, payment system innovations.”

–RAND interviewee

Data for Primary Care Research

Accurate and accessible data is the bedrock of research. AHRQ is the home for several of the databases regularly used to describe, measure, and evaluate primary care in the U.S and has played an integral role in standardizing key measures and indicators.

Since 2003, AHRQ has produced the [National Healthcare Quality and Disparities Report](#) (NHQDR), which presents data on more than 250 healthcare quality measures in both chartbooks and interactive form. While not exclusively focused on primary care, the measures can be filtered for primary care and include several measures of high relevance to primary care research such as access to care, patient centeredness, and whether standards for screening and treatment are being met for typical primary care conditions.

In 2008, AHRQ introduced primary care versions of the [Consumer Assessment of Healthcare Providers and Systems](#) (CAHPS) surveys of patients’ healthcare experiences - CAHPS-Adult Primary Care 1.0 and CAHPS-Child Primary Care 1.0. A Clinician & Group version, CG-CAHPS, was also developed and is used in primary care. CAHPS surveys, which are endorsed by the National Committee for Quality Assurance (NCQA), have been used to design quality improvement initiatives, in more than 300 research studies, and informed the development of other patient-focused surveys.^{35, 36,}

Another well-known AHRQ data initiative is the [Medical Expenditure Panel Survey](#) (MEPS), formerly called the National Medical Expenditure Survey (NMES). MEPS, a set of large-scale surveys of families and individuals, their medical providers, and employers, has been broadly used by primary care researchers. For example, [research out of Harvard](#), the Center for Primary Care, and the Institute for Healthcare Improvement used MEPS data to develop a tool to gauge how workforce and financing changes impact multiple aspects of primary care. One Technical Expert Panelist interviewed for RAND’s [Health Services Research and Primary Care Research Report](#) (2020) emphasized MEPS national impact, stating, “...if MEPS did not exist, the Congressional Budget Office couldn’t do its job. The sort of stuff

that [a health coverage expert] does, she couldn't do her job. You know, all the people who are trying to do sort of health simulation and health policy stuff, without MEPS, that's not possible.”

In 2019, AHRQ launched a \$6 million grant initiative: [*Empowering Primary Care Using Data and Analytics to Build a Healthier America*](#) to improve the application of data in primary care research. Three grantee teams examined how to integrate data on chronic disease, social determinants of health, and community services to increase the capacity of primary care practices to deliver “whole-person care” and to better manage the populations they serve.

TOPICS IN PRIMARY CARE RESEARCH

Organization of Care

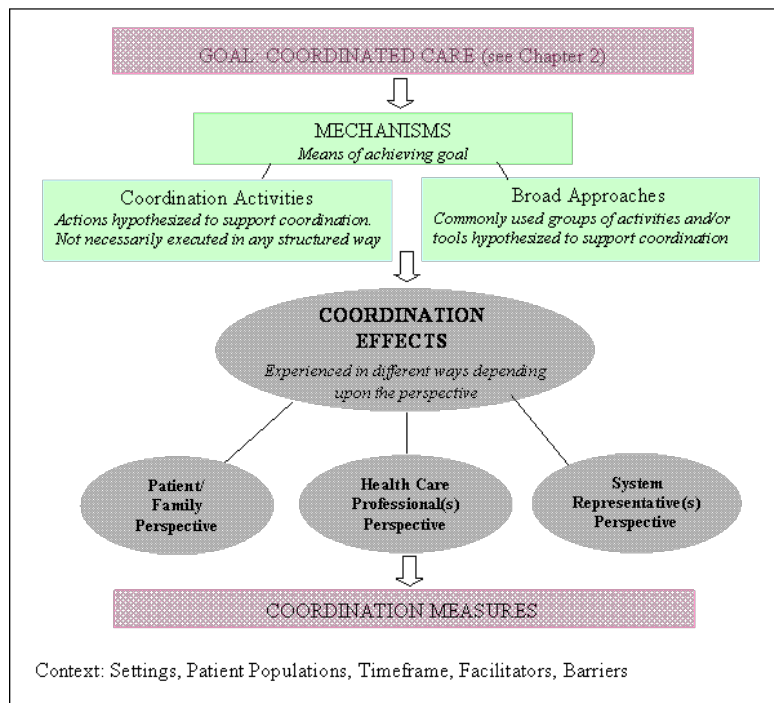
In 2001, the IOM Committee on Quality of Healthcare in America issued a report, *Crossing the Quality Chasm*, that made an “urgent call for fundamental change to close the quality gap” through a “sweeping redesign of the American healthcare system.”³⁹ Since that time, AHRQ has made numerous investments to learn how to redesign and reorganize primary care practices to improve the outcomes for patients, providers, and society. Overall, AHRQ has supported approximately 180 grants related to the organization of primary care and launched specific programs in the following areas: Care Coordination (including Care Management), Patient-Centered Medical Home Transformations, Team-based Care, Behavioral Health Integration, and Multiple Chronic Conditions.

Care Coordination

AHRQ defines care coordination as the deliberate organization of patient care activities and sharing of information among all the participants concerned with a patient's care to achieve safer and more effective care that meets the patient's needs and preferences. Care coordination is especially important given the highly fragmented nature of the current U.S. healthcare system. Barriers to care coordination include: fragmentation of clinical information technology (i.e., lack of electronic health record interoperability); scarcity of specialists and/or community resources; challenges faced by providers, practices, and health systems in providing coordinated care; and patient-specific barriers (e.g., patient resistance, lack of trust, and lack of attention to self-care).⁴⁰

In 2007, as part of a series on “[Closing the Quality Gap: A Critical Analysis of Quality Improvement Strategies](#)” AHRQ conducted a review of reviews on care coordination. The Evidence Report concluded that, although there was a broad variety of literature related to interventions aimed at improving care coordination,⁴¹ the outcome measures used to determine the success varied and few focused on structures, processes, or intermediate outcomes of the care coordination intervention. To fill this gap, AHRQ invested in the development of the [Care Coordination Measures Atlas](#) and the [Care Coordination Quality Measure for Primary Care \(CCQM-PC\)](#) to measure patient, caregiver, clinicians, and health system manager experiences with care coordination using a *Care Coordination Measurement Framework* (Figure 5). These resources are still used today.

Figure 5. Care Coordination Measurement Framework



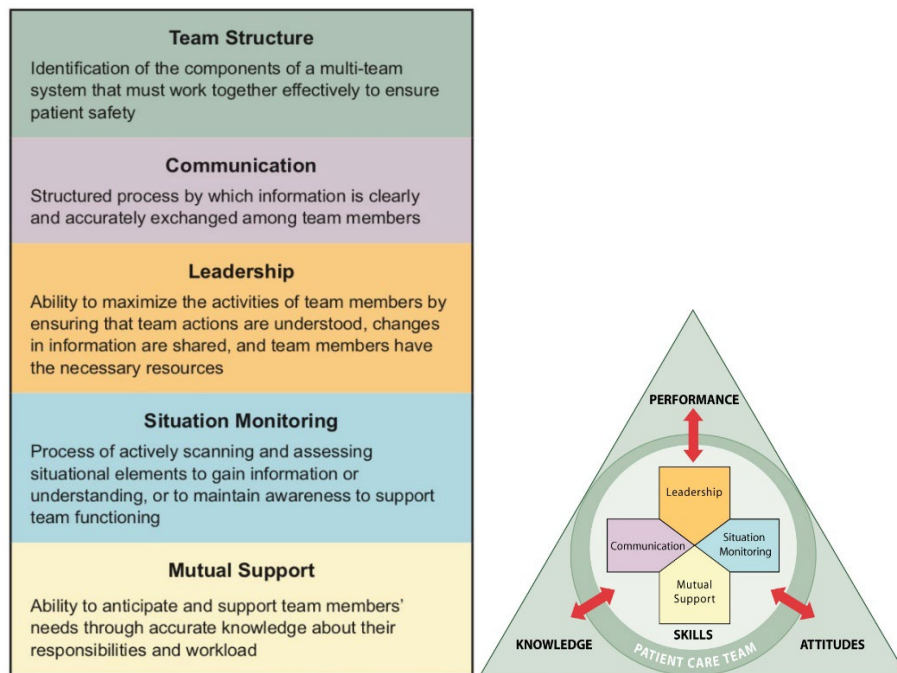
AHRQ has also funded several investigator-initiated grants that focused on improving care coordination at the point-of-care transitions, such as testing of technology to aid in care transitions,⁴² evaluation of an automated alert system to notify primary care clinicians when a patient is discharged from hospital care,⁴³ medication adherence reporting during care transitions⁴⁴, and transition coordination for pediatric asthma patients.⁴⁵

Team-Based Care

Team-based care is defined by the National Academy of Medicine as "the provision of health services to individuals, families, and/or their communities by at least two health providers who work collaboratively with patients and their caregivers—to the extent preferred by each patient - to accomplish shared goals within and across settings to achieve coordinated, high-quality care."⁴⁶ Care teams are groups of primary care staff members who collectively take responsibility for a set of patients through the blending of multidisciplinary skills.

The best-known example of AHRQ's work in team-based care is *TeamSTEPPS--Team Strategies and Tools to Enhance Performance and Patient Safety*. Developed by AHRQ and the Department of Defense (DoD) in 2003, TeamSTEPPS[®] is a systematic approach to improving quality, safety, and efficiency of healthcare. The approach was developed based on more than 20 years of research supporting the use of teamwork in healthcare⁴⁷ and the Key Principles shown in Figure 5. Other specific TeamSTEPPS projects and impact are described in the section on Safety.

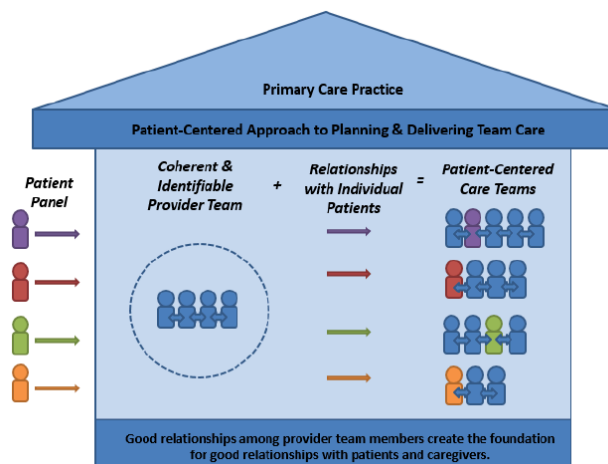
Figure 6. TeamSTEPPS Key Principles



In 2006, AHRQ released [TeamSTEPPS training programs](#) and materials for use in hospitals and health systems, leading to the training of more than 6000 master trainers and nearly 40,000 trainees in three program phases by 2014: needs assessment; planning, training, and implementation; and sustainment. Subsequently, AHRQ used evolving evidence to guide the development of *TeamSTEPPS for Office-Based Care* (2016) curricula and programming to guide primary care office-based teams. ⁴⁸ *TeamSTEPPS for Office-Based Care* is specifically based on the following skills: communication, leadership, situation monitoring, and mutual support. The Office-Based Care approach includes external practice support in the form of TeamSTEPPS Master Trainers and implementation and evaluation resources for delivery in classroom, virtual, and hybrid formats. *TeamSTEPPS Office-Based Care* is approved for continuing education credit with several organizations, including the Accreditation Council for Continuing Medical Education (ACCME), American Nurses Credentialing Center (ACCME), and Accreditation Council for Pharmacy Education (ACPE) to facilitate uptake of training by clinicians.

AHRQ has also further developed the conceptual framework of team-based care. In an AHRQ white paper, [Creating Patient-Centered Team-Based Primary Care](#) ⁴⁹ authors note that “well-implemented team-based care has the potential to improve the comprehensiveness, coordination, efficiency, effectiveness, and value of care, as well as the satisfaction of patients and providers” and that the transition to team-based care often requires “profound changes in the culture and organization of care.” AHRQ’s Team-Based Care white paper presented a conceptual blueprint for the provision of team-based care (Figure 7). This framework emphasizes the centrality of patient-centered care and positive relationships among providers to successful team-based care.

Figure 7. Conceptual Blueprint for the Provision of Patient-Centered Team-Based Care



The [Six Building Blocks](#) program, funded by AHRQ through a series of three R18 grants, is another example of an effective application of team-based care. Motivated to reduce the volume of opioid overdoses and deaths in the Northwest U.S., and to lessen the burden of opioid prescribing on primary care clinicians, the WWAMI region’s Practice Based Research Network (PI: M. Parchman) designed a team-based approach to opioid management.⁵⁰ The Six Building Blocks are strategies common to successful primary care-based opioid management programs (Figure 8).

Figure 8: Overview of the Six Building Blocks



Implementation of Six Building Blocks in rural primary care practices resulted in significant decreases in opioid prescriptions.⁵¹ Clinician and staff perceptions of work-life balance also improved with the Six Building Blocks program.⁵² The following observations were reported: increased confidence and comfort in care provided to patients with long-term opioid therapy, increased collaboration among clinicians and staff, improved ability to respond to external administrative requests, improved relationships with patients using long-term opioid therapy, and an overall decrease in stress. Six Building Blocks programs have won awards for healthcare quality, and recently, the Centers for Disease Control and Prevention (CDC) incorporated Six Building Blocks into the implementation strategy for their opioid prescribing guidelines.⁵³

With the support of AHRQ, the CDC, and the Institute of Translational Health Sciences, the original research team maintains a Six Building Blocks website, which includes a practice self-assessment, *Six Building Blocks Implementation Guide*, and [additional resources](#) for patients, clinics, and practice facilitators. COVID-19-specific resources have recently been added to the site. Additionally, along with the University of Washington, Kaiser Permanente Washington Health Research Institute, and Abt Associates, AHRQ designed *Six Building Blocks: A Team-Based Approach to Improving Opioid Management in Primary Care*, a self-service how-to-guide for practices, released in early 2021.⁵⁴ The Six Building Blocks approach is also being used to guide an AHRQ-funded contract to identify and test strategies to improve the [management of opioids in older adults](#).

Other AHRQ projects to advance team-based primary care include [Redesigning Primary Healthcare Teams for Population Health and Quality Improvement](#) and *A Review of Instruments to Measure Interprofessional Team-Based Primary Care*⁵⁵ as well as a number of grants to assess team performance in response to behavioral and social determinants of health, evaluate the impact of primary care team configuration and stability on quality of care,⁵⁶ and other aspects of understanding team-based care.

Care Management

AHRQ has been involved in supporting the development, evaluation, and implementation of care management (a team-based, patient-centered approach to assist patients and their support systems in managing medical conditions more effectively). Prevention/Care Management was a portfolio area for AHRQ for many years. Within this portfolio, funding was provided for a number of investigator-initiated studies that examined the implementation and effectiveness of care management. Key among those was work by Michael Magill and colleagues at the University of Utah developing the *Care by Design*TM approach to facilitating chronic disease management.^{57,58} This approach supported the creative use of medical assistants to provide assistance to the practice team and was taken up widely by many other health systems. Another AHRQ grantee, David Dorr, developed the *Care Management Plus* system of personnel and technology to support chronic care management that has also become widely adopted.⁵⁹⁻⁶² Additionally, Jodi Summers Holtrop investigated integration of care managers into practice compared to off-site care managers provided by health plans or health systems.⁶³⁻⁶⁸ The on-site model was found to be much more effective and widely adopted by health systems in the U.S. A complete summary of AHRQ's care management work is cataloged in a publication by Andrada Tomeia-Cotisel.⁶⁹ In summary, AHRQ's investment in research on care management helped to make this type of care more feasible in primary care by facilitating payment for it and creating the structures to help implement it in practice.

From this work, several practical tools and resources were developed. This includes a [Care Management Information Brief](#) and a [Care Management in Primary Care Implementation](#) website. AHRQ staff facilitated development of guidelines on the role of the care manager⁷⁰ and completed a [summary report](#) on the role of care management in supporting chronic disease care. AHRQ also contributed to [new payment and billing codes](#). Care management is recognized as part of the Patient-Centered Medical Home (PCMH) and includes billing under [Comprehensive Primary Care \(CPC\) Plus](#). Care Management Plus data visualization tools and curriculum are available [here](#).

Patient-Centered Medical Home (PCMH)

One of the pivotal developments in primary care has been the Patient-Centered Medical Home (PCMH). Based on the medical home concept originated by the American Academy of Pediatrics (AAP) in the 1960's, the PCMH model of care evolved as a result of related work by numerous organizations (e.g., World Health Organization, 1978 and IOM Committee on the Future of Primary Care, 1996) and research teams.^{3, 71, 72} In 2007, the AAP, American Academy of Family Physicians (AAFP), American College of Physicians (ACP), and American Osteopathic Association (AOA) endorsed the [Joint Principles of the Patient-Centered Medical Home](#). The *Principles* defined the PCMH as “a health care setting that facilitates partnerships between individual patients and their personal physicians, and when appropriate, the patient’s family.” AHRQ elaborated on this concept and described [PCMH](#) “not simply as a place, but as a model of the organization of primary care.” The five key attributes of a PCMH were defined as: 1) comprehensive care, 2) patient-centered care, 3) coordinated care, 4) accessible services, and 5) a focus on quality and safety. A number of states and organizations, including AHRQ, funded pilot work and demonstration projects focused on PCMH implementation and transformation.

AHRQ’s contribution to the development of the PCMH has centered on building research methodology and infrastructure around its transformation, and between 2008 and 2019, 27% of all primary care grants explored how to fundamentally change how care is delivered, including testing or implementing PCMH models. In 2009, AHRQ and the Commonwealth Fund supported a meeting of PCMH stakeholders entitled, “Patient-Centered Medical Home: Setting a Policy-Relevant Research Agenda” convened by the Society of General Internal Medicine (SGIM), Society of Teachers of Family Medicine (STFM), and the Academic Pediatrics Association (APA). The meeting proposed measures of PCMH impact, the identification of potential measurement challenges, and recommendations for future research⁷³ In 2010, AHRQ put these recommendations into action and awarded 14 *Transforming Primary Care* grants

(totaling \$12 million) aimed at improving understanding of transforming primary care through a retrospective analysis of systems and practices that had successfully implemented the PCMH model.⁷⁴ Grantees represented a diversity of health systems, foundations, and insurers from throughout the U.S.

The [Transforming Primary Care](#) grants resulted in more than 50 scientific publications. Findings were summarized and synthesized in [AHRQ Transforming Primary Care Grant Initiative: A Synthesis Report](#), which reported collective research outcomes for access, utilization, cost, quality of care, health outcomes, patient satisfaction/experience, and provider/staff satisfaction.

In addition, McNellis et al.⁷⁴ outlined key lessons learned about PCMH transformation:

1. A strong foundation is needed for successful redesign.
2. The process of transformation can be a long and difficult journey.
3. Approaches to transformation vary.
4. Visionary leadership and a supportive culture ease the way for change.
5. Contextual factors are inextricably linked to outcome.

These lessons have informed AHRQ's subsequent work related to the PCMH, including methodology to evaluate the success of PCMH models, instruments and measures sets, and multiple reports and white papers. AHRQ also developed an online [PCMH Resource Center](#) as a clearinghouse of tools, data, and resources to practices, practice facilitators, researchers, and policy makers.

A separate, but related, AHRQ PCMH grant initiative, *Infrastructure for Maintaining Primary Care Transformation (IMPACT): Support for Models of Multisector, State-Level Excellence*, was launched in 2011. The purpose of this initiative was to learn more about the infrastructure and support needed for successful primary care transformation. The four IMPACT grantees represented state-level initiatives that had used a primary care extension (PCE) model approach to successfully transform practice infrastructure and improve quality of care. Modeled after the U.S. Department of Agriculture's Cooperative Extension Program, the PCE Program was authorized by U.S. Congress in Section 5405 of the Patient Protection and Affordable Care Act in 2010. Unfortunately, the program was not funded by Congress.⁷⁵ AHRQ's \$4 million investment in the IMPACT pilot grants reflected a commitment to moving primary care extension implementation and research forward.

IMPACT grantees were based in New Mexico, North Carolina, Oklahoma, and Pennsylvania. Each [state-level program](#) committed to build upon PCMH initiatives through the primary care extension program

implementation and quality improvement initiatives in small primary care practices (more than 120 practices were represented among the four grantees). In addition, each grantee was responsible for collaborating with three to four partner states (17 additional states were represented in all) to develop, expand, and improve the primary care extension programming, and to evaluate their programs using quantitative and qualitative methodology.⁷⁶ Practice facilitators or health extension agents serving in a practice facilitation role were central to each of the primary care extension programs.

The work of all four IMPaCT grantees is summarized in the form of [success stories](#) on the AHRQ website, in the [AHRQ Infrastructure for Maintaining Primary Care Transformation \(IMPaCT\) Grants: A Synthesis Report](#), and by Kaufman et al.⁷⁶ Collectively, the IMPaCT investment facilitated an innovative approach to primary care transformation and quality improvement through practice facilitation, partnerships with other public agencies, policy-makers, key stakeholders, and interstate collaborations.

As an example of grantee work, the New Mexico research team incorporated collaboration among 34 primary care practices (mostly small, rural practices), Health Extension Regional Offices (HEROs), universities, Area Health Education Centers (AHECs), the state department of health, and other community-based organizations to address social determinants of health among the state's residents and share resources in promoting quality improvement in primary care. Art Kaufman, the primary investigator for the [New Mexico grant](#) describes their IMPaCT work as addressing the “social and economic forces that undermine physicians’ ability to help patients.” Practice facilitation conducted by health extension coordinators (also known as HEROs) recruited from within the communities they were serving was considered paramount to the program’s success. Among other services, HEROs advised practices as they transitioned to a PCMH model, provided technical and operational expertise related to EHR interoperability and data extraction, and connected practice clinicians and staff with professional and community resources. They even played a role in securing housing for families of hospitalized patients. The HERO program consulted with primary care collaboratives and practices in Kansas, Kentucky, and Oregon to share their learning and provide support for implementation of the primary care extension model. Outcomes of AHRQ’s investment in HERO include an IMPaCT online [toolkit](#), training program for community health workers focused on low-income populations, and the creation of new health-sector jobs.

Similar to the *Transforming Primary Care* initiative, [lessons learned from IMPaCT](#) projects were compiled:

1. Extension efforts require coordination.

2. IMPaCT grants built and sustained the complex partnerships that were necessary for the multiparty efforts required for successful extension programs.
3. Local tailoring is essential.
4. The focus of spread activities was on creating capacity for improvement through state partnerships rather than replication of the specific model used by the model state.
5. Structured peer-to-peer learning improved capacity at all levels of primary care transformation support.
6. Gaining practice buy-in is critical.
7. External influences also relate to practice buy-in.
8. Practice facilitators provide essential support to practices.

Outcomes of the IMPaCT investment include the development of multiple primary care extension [tools and resources](#), primary care transformation curricula and training programs, numerous scientific publications,⁷⁷ and on-going implementation of IMPaCT initiatives and infrastructure. The impact of this initiative is also reflected in laying the foundation for future investments in primary care transformation, with the *Estimating Costs of Supporting Primary Care Transformation* grant initiative serving as one example.

Estimating Costs of Supporting Primary Care Transformation (2013) was a \$1.5 million investment aimed at providing stakeholders with information about the costs associated with implementing and sustaining transformative primary care practice redesign. Grants (R03) were awarded to 15 research teams who worked with more than 700 primary care practices varying in size, setting, and primary care population. A variety of methods were used to estimate different types and categories of costs. Fleming et al.,⁷⁸ for example, used activity-based coding methodology to estimate costs of established primary care practices' initial PCMH transformation and accreditation, in addition to the direct and opportunity costs associated with PCMH recognition renewal. A gross-costing approach was used by Shao et al.⁷⁹ (PI: L. Shi) to estimate costs incurred by New Orleans safety net practices that completed PCMH transformation compared with those that did not. [Summaries](#) of the work of all of the *Estimating Costs of Supporting Primary Care Transformation* grantees are available on the AHRQ website. Ultimately, evidence from the 15 grantees informed the development of [Estimating the Costs of Primary Care Transformation: A Practical Guide and Synthesis Report](#).⁸⁰

Taken together, AHRQ's investment in primary care transformation through the Transforming Primary Care, IMPaCT, and Estimating Costs of Supporting Primary Care Transformation initiatives contributed

to the widespread evolution of the PCMH and advancement of related research. It provided evidence to support the [Transforming Clinical Practice Initiative](#) (TCPI) Awards (\$685 million) administered by the Centers for Medicare & Medicaid Services (CMS) and [Comprehensive Primary Care Plus](#) (CPC+), an advanced PCMH model administered by Center for Medicare & Medicaid Innovation (CMMI). AHRQ also established the Federal PCMH Collaborative as a forum for federal government agencies to collaborate and coordinate research, dissemination, and implementation related to the PCMH. Through this collaborative, the Veteran’s Health Association (VHA) PCMH model, known as the patient-aligned care team (PACT), was developed.

The National Committee for Quality Assurance (NCQA) and others continue to accredit and recognize PCMH practices today, and the PCMH model has become integral to primary care. However, as Robert McNellis, former Senior Advisor for Primary Care at AHRQ stated, “maybe what we have learned more than anything else is the name [PCMH] matters less than the substantive changes behind it...keeping in mind it is just one model of moving primary care from the old model to new ones that deliver better outcomes, better care, and better value” (personal communication).

[Integrating Behavioral Health with Primary Care](#)

[Behavioral health](#) is an umbrella term that encompasses mental healthcare and substance abuse treatment, in addition to health-related behaviors and the effect of stress on physical symptoms. In recognition of both medical and behavioral health factors’ contributions to overall health and well-being, the integration of behavioral health in primary care emerged as an effort to reorganize primary care. If done successfully, [integration of behavioral health](#) and primary care can improve coordination, communication, and whole-person care. Behavioral health integration into primary care is an important focus for AHRQ, and 18% of all primary care research grants between 2008-2019 had a mental/behavioral health focus.

In 2008, with the support of the Health Resources and Services Administration (HRSA), Substance Abuse and Mental Health Services Administration (SAMHSA), and the Office of Women’s Health and the Office of Minority Health, the AHRQ Evidence-based Practice Center (EPC) program produced a systematic review entitled, *Integration of Mental Health/Substance Abuse and Primary Care* in 2008.⁸¹ This report identified that behavioral health issues are commonly encountered in primary care, occur at a higher rate among patients with chronic disease, and that efforts to integrate behavioral healthcare and primary care had been successful (especially for depression). The report also established that

“improvements in the [coordination between mental health and primary care](#) can contribute to both better quality and lower costs.”

The *Integration of Mental Health/Substance Abuse and Primary Care* report also identified several research gaps, including care integration for conditions other than depression and for patients with serious and persistent mental illness, and the need to better understand how information technology and financial models could support the behavioral healthcare integration in primary care.⁸¹ AHRQ addressed these gaps in two ways: 1) by investing in a second systematic review to highlight research needs for integration⁸² and 2) by funding the first national conference of the newly formed *Collaborative Care Research Network* (CCRN), a subnetwork of the American Academy of Family Physicians National Research Network (AAFP NRN). Outcomes of the CCRN Conference included a research agenda, metrics framework, and importantly, a lexicon for behavioral healthcare integration.⁸³ Comprised of concepts and definitions related to the integration of behavioral health in primary care practice settings, the *Lexicon* aimed to create a common language for researchers, clinicians, and policy-makers.⁸⁴

The *Lexicon* was developed further in an AHRQ-sponsored collaborative conference with the *National Integration Advisory Council* (NIAC).⁸⁵ The NIAC ultimately established the *Academy for Integrating Behavioral Health and Primary Care*, which is an online community to foster dialogue among individuals and practices working to integrate behavioral health and primary care that remains active today. [The Academy](#), which attracted more than 70,000 users in FY2019, hosts numerous resources and tools to help primary care providers, including interactive playbooks on how to integrate behavioral health and medication-assisted treatment for opioid use disorder into primary care or other ambulatory care settings, tools and resources, and expert insights.

Since the establishment of the *Academy*, AHRQ has also funded more than 80 grant projects related to behavioral health, totaling nearly \$40 million, including three multi-grant programs to address the need for better management of substance use disorders. In 2016, AHRQ launched the “Increasing Access to Medication-Assisted Treatment of Opioid Abuse in Rural Primary Care Practices” to support rural primary care practices in delivering medication-assisted treatment (MAT). Grantees in Oklahoma, Colorado, Pennsylvania, and North Carolina (a fifth state, New Mexico, was added in the following year) used the Project ECHO Hub and Spoke model of care and practice facilitation to enhance MAT for opioid use disorder in rural communities. Through telementoring learning communities, state health departments, academic health centers, researchers, local community organizations, and healthcare clinicians collaborated to bring evidence-based MAT to more than 20,000 patients.

In 2019, AHRQ launched a grant initiative to reduce [Unhealthy Alcohol Use](#), which has disseminated and implemented into primary care practices evidence-based approaches to improve the use of screening for unhealthy alcohol use, brief intervention for those at risk, and medication therapy for alcohol use disorder. Together, the 6 grantees worked with close to 300 primary care practices across the country. The implementation strategies incorporated AHRQ's established EvidenceNOW model for practice support. Early findings show significant improvements in screening rates for several projects.

In 2020 AHRQ awarded three grants in response to the number of hospitalizations and emergency department visits related to opioids among older adults. The Management of Opioids and Opioid Use Disorder in Older Adults grants will develop, implement, evaluate, and disseminate strategies to improve the management of opioid use, misuse, and opioid use disorder (OUD) in older adults in primary care settings. These grants are part of a broader AHRQ initiative to improve management of opioids among older adults that includes a technical brief and an ACTION learning collaborative.

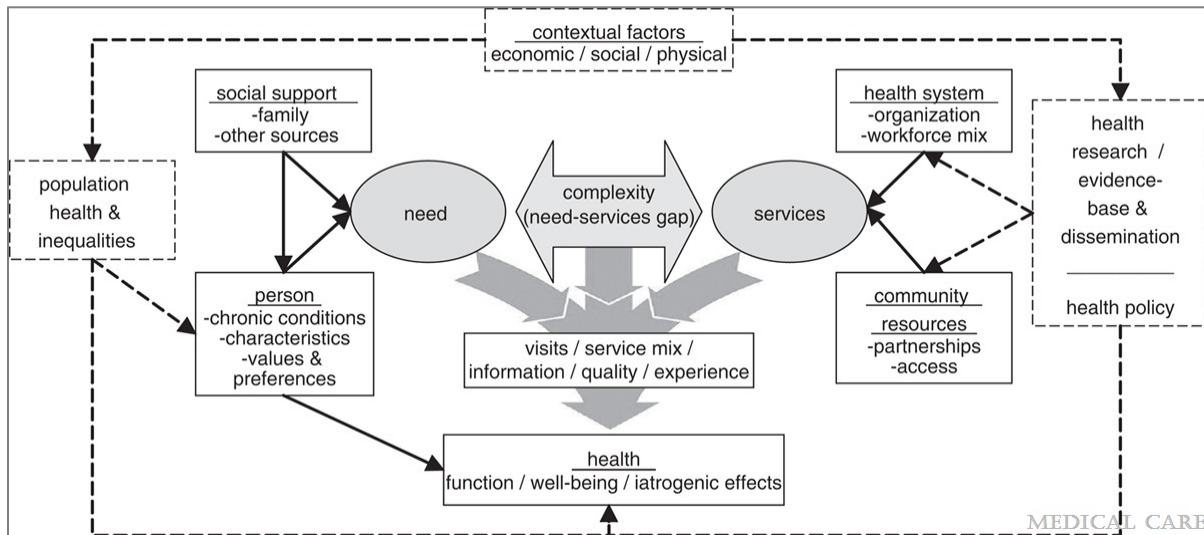
Multiple Chronic Conditions (MCC)

Improving outcomes for patients with multiple chronic conditions (two or more chronic conditions) or MCC is a major challenge for the healthcare system, particularly in primary care. Approximately half of people ages 45-64 and 80% of those older than 65 years of age experienced MCC, and the proportion of Americans impacted was on the rise.⁸⁶ MCC are associated with decreased functional status, poor health outcomes, and mortality.⁸⁶ Unnecessary hospitalizations, adverse drug events, and conflicting medical advice add to the burden of MCC to patients and their families.⁸⁷ In addition, MCC are associated with high healthcare costs to both patients themselves, and the overall healthcare system. More than two-thirds of healthcare expenditures were dedicated to patients with MCC.⁸⁸ Improved care coordination for patients with MCC has the potential to improve all these outcomes.³⁹

From 2008 to 2019, 9% of all primary care research grants focused on MCCs. In 2010, responding to the fact that nearly 100 million Americans were living MCC, and that primary care clinicians needed better tools to treat MCC, AHRQ funded the *AHRQ MCC Research Network*. The goal of the Network was to advance evidence-based care for individuals living with MCC in alignment with the HHS MCC Strategic Framework.⁸⁹ Specifically, the MCC Network aimed to uncover “how health systems and healthcare professionals can better partner with patients living with MCC to create patient-centered management

plans.”⁹⁰ This network included a *MCC Learning Network and Technical Assistance Center* to provide support and facilitate communication among MCC researchers. One network outcome involved the development of a *MCC Conceptual Model* (Figure 9)⁹¹ that positioned the relationship between an individual’s needs and the capacity of healthcare services to support these needs central to the model.

Figure 9. A Conceptual Model of the Role of Complexity in the Care of Patients with Multiple Chronic Conditions⁹¹



Collectively, the network “advanced the field of MCC research, provided guidance to clinicians and patients, and advised policymakers about improved methods for measuring and promoting quality care for MCC patients.”⁸⁹ In addition, a *Medical Care Journal* supplemental issue and more than [85 scientific publications](#) resulted from network initiatives. Research findings were also presented at numerous professional conferences, meetings, and webinars. The *MCC Chartbook*,⁹² developed based on MEPS data to provide stakeholders with nationally representative data about patients with MCC, was also an outcome of AHRQ’s MCC work.

Building on this work, in 2014, AHRQ funded 14 additional grant projects: seven large (R01) grants and seven R21 grants focused on research methodology and the use of large data sets to advance care for patients with MCC. One of the grantees, a Duke University research team (PI: M. Maciejewski), explored medication prescribing in Medicare patients with cardiometabolic conditions across 10 states. Results

showed that the nearly 400,000 patients studied averaged five chronic conditions and took 10-12 medications, on average.⁹³ Importantly, the results also showed that patients who saw more healthcare providers took more medications and were more likely to be prescribed duplicate medications than patients with the same conditions who saw fewer providers. This work resulted in recommendations for improved care coordination for patients with MCC and led to the 2020 [summit on transforming care for MCC](#).

AHRQ applies the Care and Learn Model, developed by AHRQ researchers to map the work of the Agency and its research portfolio, to identify areas of unmet need and prioritize research questions with the most value for advancing the care of people with MCC. The Care and Learn Model starts by placing the patient at the center of care. It encourages learning about how best to care for patients by closely evaluating how well patients are doing and identifying which of their needs are not being met. The model aligns the two primary functions of the health system: providing care that meets the needs of diverse individuals and populations and continually learning by implementing evidence and using data to increase our understanding of what works. The Care and Learn Model brings together essential caring functions with data-driven evidence generation, synthesis, and implementation.⁹⁴

QUALITY

Quality improvement (which refers to a continuous and ongoing effort to achieve measurable improvements in the efficiency, effectiveness, performance, accountability, outcomes, and other indicators of quality in services or processes which achieve equity and improve the health of the community) has been a part of the Agency's mission since the establishment of AHCPR in 1989. The Agency has made significant investments in research to identify effective methods and strategies for quality improvement in primary care, although between 2008 and 2019, only 9% of all funded primary care grants explicitly used quality improvement processes to achieve the intended outcome.

Practice Facilitation

Practice Facilitation (PF) is one of AHRQ's best known examples of how to put evidence into action. One AHRQ leader stated, "At AHRQ, we believe that the secret ingredient for helping practices make substantive and meaningful changes necessary to improve care is practice facilitation." Practice facilitators utilize a variety of strategies and methods focused on organizational development, project management, quality improvement, and practice improvement.

The history of PF dates to the Oxford Heart Attack and Stroke Project (England) in the mid-1980's,⁹⁵ but has since gained popularity in the U.S. and other countries.⁹⁶ Practice Facilitation involves the provision of ongoing external support (i.e., practice facilitators) to primary care practices with a goal of improving patient outcomes and developing practice capacity for sustained quality improvement.⁹⁶ Recognizing that “most practices lack time, energy, and resources to make changes on their own, and most lack means of learning about the policies pushing them to change or examples from which they can learn,” practice facilitators “help physicians and improvement teams develop the skills they need to adapt clinical evidence to the specific circumstance of their practice environment.”⁷⁷

AHRQ's 2010 *Consensus Meeting on Practice Facilitation for Primary Care Improvement*, which convened a panel of PF experts to advance knowledge of PF, identify best practices, and explore needs for future work, served as a launching pad for multiple investments in PF. AHRQ initially developed a portfolio of PF resources and tools as part of the PCMH work, including a dedicated web page within the PCMH Resource Center, webinars, a how-to guide, model curriculum, handbook, and exemplary case studies, in addition to products focused on PF for health information technology integration, quality improvement, and patient-centered care. AHRQ's 14 [Practice Facilitation training modules](#) are available for learners and trainers. Building on this resource, AHRQ worked with the North American Primary Care Research Group (NAPCRG) to hold the first International Conference on Practice Facilitation in 2017,⁹⁷ which continues annually, opening the door for relationships among practice facilitators from multiple countries.

As of 2020, AHRQ's largest investment in primary care research (\$112 million) was EvidenceNOW: Advancing Heart Health, which was designed to evaluate the effectiveness of PF and other external supports (ex: academic detailing and learning collaboratives) in primary care quality improvement and in building the capacity for implementing patient-centered outcomes research findings. The initiative aligned with the Department of Health and Human Services' [Million Hearts](#) national initiative to prevent 1 million heart attacks and strokes within 5 years.⁹⁸ Seven implementation grants were awarded to regional cooperatives throughout the U.S. Grantees were tasked with designing multi-component external quality improvement interventions (ex: practice facilitation; data, feedback and benchmarking; health information technology support; local learning collaboratives; and/or academic detailing) to improve the ABCS of heart health (i.e., appropriate Aspirin use, Blood pressure control, Cholesterol management, and Smoking cessation support) in small or medium-sized primary care practices. Mostly small and medium-sized practices of <10 clinicians were recruited since they represented nearly 90% of office visits in the

U.S.⁹⁹ and have been shown to have fewer resources dedicated to quality improvement.¹⁰⁰ In addition to the seven implementation grants, AHRQ also provided grant funding to [ESCALATES](#), an independent national evaluation of EvidenceNOW¹⁷

Overall, EvidenceNOW: Advancing Heart Health practice facilitators worked with 1500 primary care practices, 5000 primary care professionals, and more than 8 million patients.¹⁰¹ Final results are published on AHRQ's [website](#). EvidenceNOW: Advancing Heart Health demonstrated promising results with practices participating in the initiative. For example:

- Practices across the Cooperatives dramatically improved the number of QI strategies used to improve care.
- In almost every Cooperative, practices with lower baseline QI capacity made larger improvements than practices that started with higher capacity.
- More hours of practice facilitation, and more months with at least one practice facilitation visit, were associated with larger improvements in QI capacity. Frequent and consistent practice facilitation works best.

Findings showed that EvidenceNOW practices also improved heart health services and outcomes at significantly greater rates after receiving external support than before receiving support, including a:

- 7.3% increase in smoking screening and cessation counseling.
- 3.4% improvement in prescribing aspirin for eligible patients.
- 4.4% increase in cholesterol management.
- 1.6% increase in blood pressure control—an important finding, given decreasing national rates of blood pressure control.

The late Dr. David Meyers, AHRQ's Deputy Director and Chief Physician at the time, shared that “what we learned about the practices and the implementation process is perhaps even more valuable than the ABC outcomes measures themselves in terms of creating a foundation for quality improvement in primary care”. For example, EvidenceNOW projects have both elucidated the barriers to obtaining consistent and reliable EHR data for quality improvement efforts¹⁰²⁻¹⁰⁴ and described the approaches that practice facilitators have used to problem-solving related to multiple EHR challenges encountered by practices.¹⁰⁵

The model of Practice Facilitation that EvidenceNOW tested has extended through numerous scientific [publications](#), a collection of EvidenceNOW implementation [tools and resources](#), and has become the basis

of numerous subsequent dissemination projects, both at AHRQ and beyond. Robert McNellis, former Senior Advisor for Primary Care at AHRQ, described EvidenceNOW as having “changed the culture of primary care. People refer to it at conferences and in the regular language of primary care.”

Improving Equity in Primary Care

Improving healthcare quality through the provision of equitable, accessible care for all Americans is an important part of AHRQ’s mission. The Agency has specifically invested in research to reduce disparities in primary care, in addition to the generation of data for this research. Published since 2003, the [National Healthcare Quality and Disparities Report](#) is a key example. This report includes information related to care access, cost of care, care coordination, effectiveness of treatment, patient safety, healthy living and person-centered care, as well as disparities associated with race and ethnicity and other social determinants of health. National Healthcare Quality and Disparities Report data previously revealed disparities in occurrence of and treatment for [hypertension](#), with non-Hispanic Blacks and Native Hawaiians demonstrating poorer blood pressure control. This information has informed programs and future research to reduce disparities in the prevention, identification, and treatment of hypertension.

In addition to the National Healthcare Quality and Disparities Report, an internal portfolio analysis of AHRQ primary care research grants between 2008 and 2019 (see Appendix A) found that 20% focused on racial/ethnic minorities or LGTBQ, 15% on low-income populations, and 3% on those with disabilities and special health needs. Overall, 37% of grants specifically addressed the needs of AHRQ priority populations.

The Effective Healthcare Program

To deliver high-quality care, providers and health systems need to know which interventions and programs actually work. Although this sounds straightforward, finding, interpreting, and synthesizing all the available studies into a reliable and actionable conclusion is anything but simple. To meet this challenge, AHRQ created the [Evidence-based Practice Center](#) program in 1997 with the goal of helping consumers, healthcare professionals, and policymakers make informed and evidence-based healthcare decisions. In 2005, the Effective Healthcare Program was built around the EPC program to support methods development and dissemination. Although the EPC program is not restricted to primary care, primary care topics (such as gastroesophageal reflux disease, diabetes, and hypertension) make up the

largest set of review topics, and the EPC program partners with the major primary care guideline groups, including the AAFP, AAP, ACOG, and ACP to support the development of guidelines for primary care.

“Throughout my career I’ve relied on AHRQ for their compendium of research reviews. I actually was just looking at an AHRQ report today about mobile health apps for improving diabetes control.”

- RAND interviewee

While the EPC program focuses on providing relevant and timely answers to meet the needs of decision makers, the EPC program has also had an impact on primary care research, by setting standards and defining research priorities in primary care topics. The EPC program pioneered standards for conflict of interest and stakeholder engagement in systematic reviews¹⁰⁶ and developed a systematic approach to identifying evidence gaps and research needs as an integral product of the review process. In addition, the EPC program provides the evidence reviews for the NIH’s Pathway to Prevention program, which identifies methodological and scientific weaknesses in specific disease areas (many of which fall under primary care), suggests research needs, and seeks to move the field forward through an unbiased, evidence-based assessment of a complex public health issue.

Person-Centered Care

Primary care cannot be patient-centered without understanding how to improve both personal and organizational health literacy. AHRQ’s many research investments in health literacy have produced findings and tools that contribute to the delivery of high-quality healthcare. These include:

- Seminal evidence reviews of the association of literacy and health outcomes and health literacy interventions.
- Intellectual contributions that have produced conceptual models and frameworks, such as the Health Literate Care Model¹⁰⁷ and the [Ten Attributes of a Health Literate Organization](#), as well as other articles and book chapters related to [health literacy](#).
- Testing of tools in and for primary care practices, such as the AHRQ [Health Literacy Universal Precautions Toolkit](#) and the [Patient Education Materials Assessment Tool](#) (PEMAT).
- The AHRQ [Informed Consent and Authorization Toolkit for Minimal Risk Research](#), which helps the primary care research community ensure inclusion of populations with limited health literacy in studies.
- Research [measures of health literacy](#) that enable study of health literacy disparities and examine interventions' effects on populations with limited health literacy.

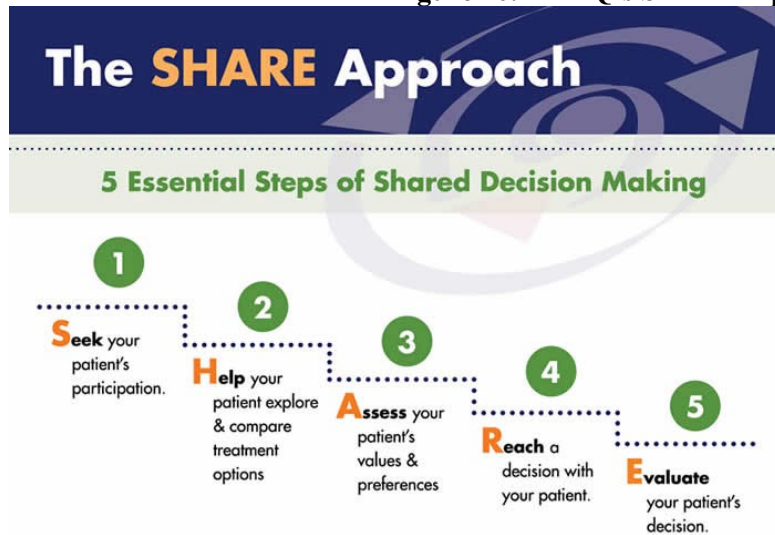
- Survey measures and data on health literate practices by providers, including [CAHPS supplemental items on health literacy](#) and microdata from the AHRQ's Medical Expenditure Panel Survey (MEPS).

Self-management support is an important part of both patient-centered care and care coordination in primary care settings. Managing chronic illness and changing behavior are challenging and take time for everyone involved—providers, patients, and caregivers. Yet, it is often patients themselves who are called on to manage the broad range of factors that contribute to their health. Using self-management support in primary care can have a positive effect on the care and health outcomes of people with chronic conditions, as well as provider and patient satisfaction. AHRQ has developed a variety of resources to help primary clinicians and teams learn about and implement [self-management support](#), including a library of resources and videos to help clinicians learn and implement this concept, and The [Patient Education Materials Assessment Tool](#) (PEMAT) and User's Guide. The PEMAT is a systematic method to evaluate and compare the understandability and actionability of patient education materials. It is designed as a guide to help determine whether patients will be able to understand and act on information. Although the PEMAT is not restricted to primary care research, patient education is central to primary care.

Shared Decision Making.

AHRQ's [SHARE Approach](#) (Figure 10) is a five-step process for shared decision making that includes exploring and comparing the benefits, harms, and risks of each option through meaningful dialogue about what matters most to the patient. A [Fact Sheet \(PDF, 756 KB\)](#) about the program is available, and the [SHARE Approach Workshop curriculum](#) was developed to support the training of healthcare professionals on how to engage patients in their healthcare decision making. In addition, a collection of reference guides, posters, and other resources, were designed to support implementation of AHRQ's SHARE Approach.¹⁰⁸

Figure 10. AHRQ's SHARE Approach



SAFETY

AHRQ is known for prodigious work in healthcare safety. The focus on safety grew after the 1999 IOM seminal report, *To Err is Human: Building a Safer Health System*, as part of their *Quality of Health Care in America* series. This report described the current state of medical errors and safety risks in the healthcare setting, positing that “the problem is not bad people in health care--it is that good people are working in bad systems that need to be made safer.”¹⁰⁹ A call for research to design a safer health care system was put in motion. Under the direction of Helen Burstin, CP3 Director, AHRQ responded by funding a [conference](#), in conjunction with CMS and the Partnership for Patient Safety, to develop a research agenda related to ambulatory patient safety in 2000. This enhanced focus on safety kicked off a consistent commitment to research aimed at improving patient safety across healthcare, including in the primary care setting, and between 2008 and 2019, 31% of primary care grants included improving patient safety as an intended outcome or justification.

“So if I had to say what's been the biggest impact of AHRQ's research, I'd say the most publicized and well-documented impact is on safety. I think that they can really take credit for a lot of that work. Yes, CMS and others contributed, but they were the knowledge engine that helped to make that happen. And AHRQ really is that knowledge engine, sort of the intel inside. It needs to create the evidence and the tools and the ability for the system to improve.”

- RAND interviewee

Medication Safety

Between 2008 and 2019, 13% of awarded grants explored interventions intended to ensure that patients are on the correct medications (i.e., reconciliation) or that patients adhere to their medication regimens. Forty Ambulatory Safety and Quality Program (ASQ) projects involved medication management and safety. One example was the [*Medication Safety – Translating Research into Practice \(MS-TRIP\)*](#) project conducted by the Practice Partner Research Network (PPRNet, 160 primary care practices in 41 states), which provided several forms of support to practices to aid in the use of their EHR’s medication safety clinical support features. Over a two-year period, improvements in medication safety, including avoidance of potentially inappropriate therapy and monitoring of potential adverse events, improved significantly. The intervention and medication prescribing indicators developed in the study have been published ^{110, 111} and continue to inform quality and safety within this practice network and others.

“And the other thing that I would say that is impactful, AHRQ has been successful in drawing attention to patient safety in primary care. Because when you look at the literature, most patient safety studies are done in hospitals. And primary care is also sensitive to, you know, patient safety threat. And I think those two areas are that makes AHRQ unique and impactful.”

-RAND interviewee

Following completion of the *MS-TRIP* study, AHRQ contracted with PPRNet (PI: L. Nemith) as part of the Practice-Based Research Network (PBRN) funding mechanism to pilot test a digital health intervention aimed at improving delivery of preventive services in eight primary care practices. ¹¹² Through the use of electronic standing orders and innovative service delivery by nurses and medical assistants, *Screening, Immunizations, and Diabetes Care Management (SO-TRIP)* was associated with significant improvements in the delivery of preventive screenings, immunizations, and diabetes care measures. For example, administration of the influenza vaccine in older adults increased from 8% pre-intervention to 37% post-intervention. Similarly, hemoglobin A1c screening increased from 6% to 54% with the intervention. This process, along with qualitative data collected from the research team about adoptability and sustainability of electronic standing orders, EHR technical issues, and reimbursement policy challenges were used to improve quality of care throughout the PPRNet learning community and to inform further research. ¹¹²⁻¹¹⁴

Comprehensive Unit-Based Safety Program (CUSP)

The [*Comprehensive Unit-Based Safety Program \(CUSP\)*](#) is one of AHRQ's most recognized safety initiatives. CUSP was designed to reduce the occurrence of healthcare-acquired infection (HAI) and promote patient safety. Based on seminal work completed by Peter Pronovost and team at Johns Hopkins University in 2001, CUSP focuses on how clinical team members work together through safety education, process improvement, teamwork, and learning from results to improve patient safety.^{115, 116} The effectiveness of CUSP was evaluated and validated at numerous hospitals throughout the U.S. and in 2014, was adapted for the primary care setting.¹¹⁷ The CUSP model has been implemented nationally and endorsed by more than 40 state hospital associations and the American Hospital Association. Dr. Pronovost has remarked that the broad impact of CUSP “started with just an initial \$500,000 investment from AHRQ.”

Care Transitions

Another area of healthcare that AHRQ has targeted to improve patient safety is care transitions. For example, a 2014 AHRQ grant (PI: Hewner) funded the development and pilot testing of a [*clinical decision support and health information exchange*](#) designed to improve care transitions for Medicaid patients with MCC. Through automated care transition alerts to primary care practices when a patient was discharged from the hospital, coordination of care for MCC patients improved and subsequent emergency department utilization and inpatient hospital stays declined. This research and others were identified by 2020 AHRQ-funded work by John Snow, Inc. that supported exploratory research into innovative approaches to care transitions aimed at reducing hospital readmissions, a primary care version of AHRQ's [*Re-Engineered Discharge \(RED\) initiative*](#). A conceptual framework related to primary care approaches to reduce hospital readmissions was developed.¹¹⁸ The conceptual framework has five principles, or fundamental concepts:

1. The primary care team should serve as the key integrator of patient care.
2. Several critical steps differentiating a post-discharge follow-up visit from a typical office visit require reliable primary care systems to be in place. (See the [*Final Report: Potentially Preventable Readmissions: A Conceptual Framework to Rethink the Role of Primary Care*](#))
3. Within the primary care practice, high-quality care transitions require defining a system of care that is team-based and encompasses the admission, the immediate post-discharge period, the first follow-up visit, and the immediate post-visit period, including additional follow-up visits.

4. At the healthcare systems level, primary care must develop and implement a systematic approach to timely, appropriate, bidirectional information exchange and coordination with hospitals, post-acute care agencies, and behavioral health and social support services.
5. The primary care team must systematically assess and address whole-person needs in a patient-centered fashion that leverages the clinician-patient relationship.

TeamSTEPPS®

TeamSTEPPS® Office-Based Care (described above in the team-based care section) has decreased clinical error rates, improved communication, and resulted in improved patient satisfaction.⁴⁸ MetroHealth, an Ohio-based health system that includes 23 primary care centers and 1.2 million ambulatory visits annually, showed benefits of system-wide TeamSTEPPS implementation on quality and safety. They observed increased team awareness, clarified team roles and responsibilities, conflict resolution, and improved information sharing among clinicians and staff. MetroHealth and six other health systems or academic medical centers have been designated as Regional Training Centers, working to expand TeamSTEPPS training opportunities. Some TeamSTEPPS trainings have been delivered using innovative pedagogy, including virtually¹¹⁹ and with the incorporation of simulation.

PRIMARY CARE WORKFORCE

Describing the Workforce

AHRQ has sponsored multiple initiatives to evaluate and assess the primary care workforce and improve the workforce experience. In 1999, for example, an AHRQ-funded team attempted to quantify the number of generalist physicians practicing in the U.S. using the Physician Masterfile of the American Medical Association (AMA).¹²⁰ They reported that only 25% of U.S. physicians were generalist-only (as opposed to specialists also providing general healthcare services), which is less than previously reported. Ten years later, AHRQ commissioned the Robert Graham Center, a non-partisan primary care policy and analysis organization, to conduct a primary care workforce analysis.¹²¹ One impactful outcome of the Graham Center analysis was an estimate of future demand for primary care. This estimate, and other data, informed the 2010 Affordable Care Act's Primary Care provisions, which established incentives for medical students specializing in primary care, expansion of primary care training programs, and the National Healthcare Workforce Commission, among other provisions.

Expanding the Workforce

In addition to simply describing the primary care workforce, AHRQ has worked to identify strategies to expand it. AHRQ-funded research teams^{122, 123} outlined recommendations for addressing the primary care workforce crisis – that is, decreasing numbers of medical school graduates entering a family medicine or internal medicine residency program and the diminishing number of primary care physicians who remain in the profession. Schwartz et al.¹²² stated that, “in the absence of a major overhaul of economic incentives in favor of generalist careers, we will need to work at these multiple levels to restore balance to the generalist physician workforce and align with the desires and expectations of patients for continuing healing relationships with generalist physicians.” Economic incentives proposed by Song et al.¹²³ proposed that CMS reward teaching hospitals whose graduates remain in primary care for three or more years.

Expanding the role of the nurse practitioner (NP) and physician assistant (PA) in primary care is another approach to building the primary care workforce. AHRQ funded a University of Texas Medical Branch team (R01, PI: Y.Kuo) to explore the role of the NP in the primary care of older adults. This work resulted in 22 peer-reviewed publications. Researchers specifically reported a 170% increase in the number of Medicare patients using NPs as their primary care provider from 2007 to 2013.¹²⁴ No differences in complexity of patients treated by NPs and physicians were observed,¹²⁴ and patients with diabetes who were treated by NPs were less likely to be hospitalized than patients treated by physicians.¹²⁵ AHRQ also sponsored a Northeastern University team (R03, PI: L. Poghosyan) to develop a NP primary care organizational climate questionnaire and evaluate factors that influence NP autonomy, job satisfaction, and effectiveness in primary care.¹²⁶⁻¹²⁹ In a third AHRQ-sponsored project, *Predictive Modeling the Physician Assistant Supply: 2010 to 2025*, Hooker et al.¹³⁰ projected growth of the PA profession and made recommendations for education and policy steps to enhance the primary care PA workforce. As part of their work with AHRQ, the Graham Center developed a [“facts and stats”](#) communication related to primary care NPs and PAs in the U.S.

Re-Configuring the Workforce

Although team-based care was associated with high-quality primary care,⁴⁹ in 2008, there was a paucity of information concerning the composition of successful primary care teams. Thus, AHRQ commissioned a contract team comprised of AHRQ, Abt Associates, MacColl Center for Health Care

Innovation, and Bailit Health, LLC researchers to perform a mixed-methods evaluation of [primary care workforce configurations](#). Quantitative and qualitative data from more than 70 primary care practices participating in primary care innovation programs were used to form configuration and staffing models (*The Index Model, High Geriatric Model, High Social Need Model, and Rural Model*), and to estimate associated costs of each configuration.¹³¹ Information learned from this project is summarized in a *New Models of Primary Care Workforce and Financing Case Example* series.¹³² The series also highlights the innovative incorporation of a variety of healthcare professionals, including community health workers, care managers, pharmacists, and scribes in the primary care setting.¹³³ Taken together, this work is predicted to inform primary care staffing and ongoing discussions related to workforce planning.

Sustaining the Workforce

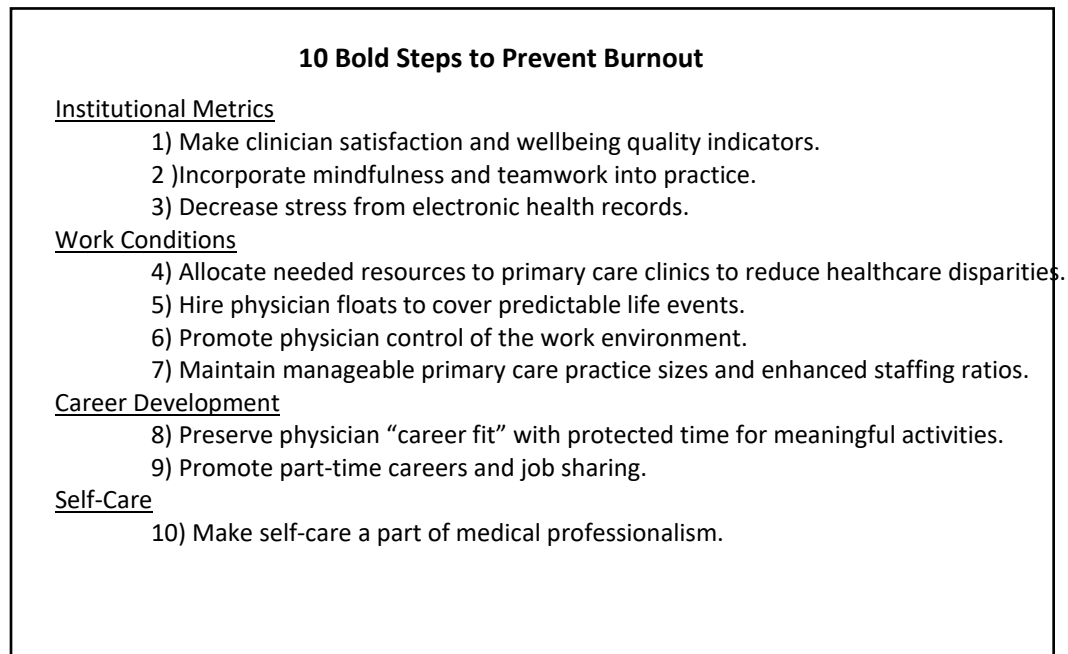
Experts in health services have recommended the recognition of a healthcare *Quadruple Aim*, which adds healthcare provider joy and well-being to the broadly recognized goals of improved health outcomes, enhanced patient experience, and reduced costs.¹³⁴ Provider dissatisfaction and burnout - a long-term stress reaction marked by emotional exhaustion, depersonalization, and lack of sense of personal accomplishment – can impact quality of care, patient satisfaction, and ultimately, health outcomes. Furthermore, as described in a [2017 blog post](#) by then AHRQ Director, Gopal Khanna and CEPI Director, Arlene Bierman, “the emotional exhaustion of burnout can have professional and personal consequences for physicians. Burnout can damage morale and lead once-enthusiastic, dedicated doctors to quit practicing medicine completely. It can also lead to depression, alcohol abuse, and thoughts of suicide.”

Clinician satisfaction and the minimization of burnout have been important foci for AHRQ since the early 2000’s.¹³⁵⁻¹⁴¹ Mark Linzer, a leading physician burnout researcher from the Minneapolis Medical Research Foundation, has led several AHRQ-funded studies. The initial study, *Minimizing Error, Maximizing Outcome (MEMO)*, reported that work conditions, such as time pressure, chaotic environments, low control over work pace, and unfavorable organizational culture, were strongly associated with physicians’ feelings of dissatisfaction, stress, burnout, and intent to leave the practice.¹⁴² Nearly half of participants (primary care physicians in New York, Chicago, and Wisconsin) described their practice environment as “trending toward chaotic” or “chaotic”, while 61% reported that their work was stressful and 27% described symptoms of burnout. On a positive note, stress and burnout rankings were not associated with quality of patient care, medical errors, and patient satisfaction. Further work by Dr. Linzer’s team focused on the impact of practice chaos,¹⁴³ “the electronic elephant in the room”, the EHR.¹⁴⁴⁻¹⁴⁶ AHRQ awarded an implementation grant (R18) for the *Healthy Work Place* study to Linzer’s

team in 2009.¹⁴⁷ In this study, interventions (12-18 months) to address communication and workflow and quality improvement projects were effective in reducing burnout and improving quality of care among New York primary care clinics.

In 2014, Linzer and his colleagues¹⁴⁸ published “10 bold steps to prevent burnout” (Figure 11).

Figure 11. 10 Bold Steps to Prevent Burnout



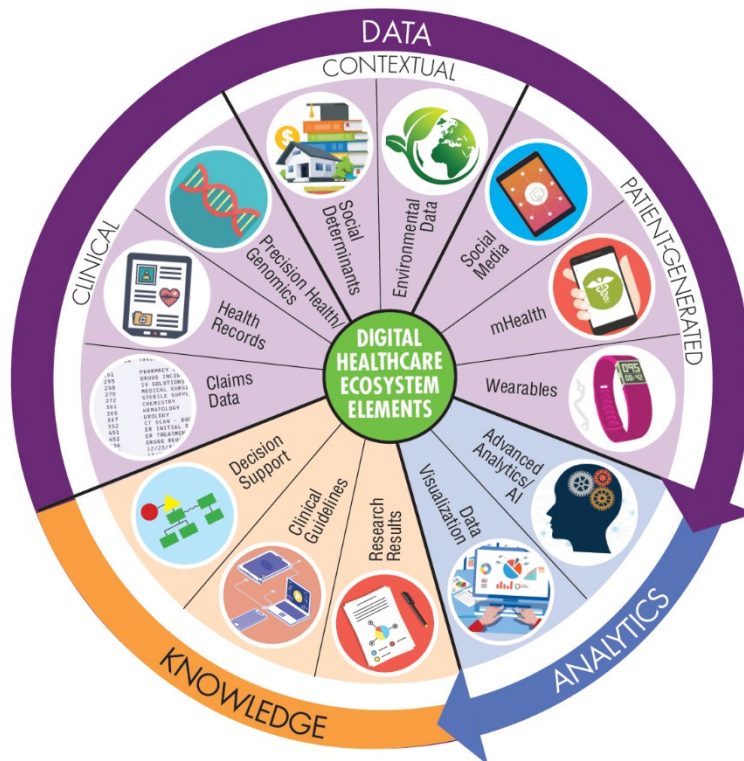
Another outcome of AHRQ’s investment in clinician burnout research is the [Mini Z Burnout Survey](#). This survey, which enables practices to quickly assess stress and burnout levels among staff members, is endorsed by the [American Medical Association](#) and the American College of Physicians.

DIGITAL HEALTHCARE

Although technology-based work dates back to the earliest days of the Agency, The Division of Health Information Technology (Health IT) was formally created by AHRQ in 2004. As healthcare and technology continued to intersect in increasing ways, and the use of data and analytics in healthcare

evolved, a new division – the Digital Healthcare Research Division – was created in 2019. This new division recognizes multiple components of an overall digital healthcare ecosystem (Figure 12).

Figure 12. Digital Healthcare Ecosystem



“Our research needs to determine how the various components of the ever evolving digital healthcare ecosystem can best come together to positively affect healthcare delivery and create value for patients and their families,” [wrote Chris Dymek](#), the Director of AHRQ’s Digital Healthcare Research Division. A great deal of AHRQ’s digital healthcare work has involved primary care. In fact, more than 250 primary care research grants funded between 2008 and 2019 either focused on or included digital healthcare (60% of all funded grants during this period leveraged health information technology to enhance, improve, or build on a care process). Although the full digital healthcare ecosystem is reflected in AHRQ’s primary care research portfolio, notable investments in telehealth, EHR, clinical decision support (CDS), and health information exchange (HIE) will be highlighted below.

Telehealth

[Telehealth](#) is defined by AHRQ as the delivery of health-related services and information via telecommunications technologies in support of patient care, administrative activities, and health education. Telehealth may involve clinician-to-patient interaction or clinician-to-clinician interaction through consultations, mentoring, continuing medical education, and other services to improve the overall delivery and quality of healthcare to patients, especially in underserved rural populations.

[Project ECHO - Extension for Community Healthcare Outcomes](#) - is an example of a modest AHRQ investment that has resulted in remarkable downstream impact. A tele-mentoring program designed to interface specialist physicians with primary care physicians, Project ECHO was founded by Sanjeev Arora, who was awarded a \$1.4 million Transforming Healthcare Quality Through Information Technology grant from AHRQ for this work in 2004. Dr. Arora was inspired to create Project ECHO as a means of expanding care for patients with Hepatitis C living regions of New Mexico with minimal access to specialist physicians. Through “moving knowledge, not patients,” Hepatitis C specialists at the University of New Mexico Health Sciences Center implemented weekly virtual case-based collaboration (aka: “learning loops”) with primary care clinicians and other community health workers in underserved areas throughout the state. Overall, Project ECHO-trained rural primary clinicians provided care that was as safe and effective as that provided by academic medical center specialists.¹⁴⁹ Importantly, primary care clinicians reported increased knowledge and self-efficacy in treating Hepatitis C patients, decreased professional isolation, and enhanced professional satisfaction.¹⁴⁹

The success of the first Project ECHO has been followed by numerous follow-up programs and interventions. Project ECHO has been used for more than 75 health topics in over 400 hubs throughout the world (Figure 13) in initiatives funded by AHRQ, the Veteran’s Health Administration, PCORI, NIH, Centers for Disease Control, Robert Wood Johnson Foundation, GE Foundation, Bristol Myers Squibb Foundation, and many others. Results of this work have been published in hundreds of books, peer-reviewed articles, research briefs, and conference presentations. Two systematic reviews of the Project ECHO literature report costs savings and increased access to care in remote locations¹⁵⁰ and improved health outcomes for patients with Hepatitis C, chronic pain, dementia, and Type 2 diabetes.¹⁵¹

Figure 13. Project ECHO Worldwide Program Sites



The Project ECHO model has been employed during the COVID-19 pandemic to support clinicians in the rapid adoption of telehealth. The Assistant Secretary for Preparedness and Response, HHS, the Public Health Foundation, and others have teamed with The ECHO Institute to offer [Telemedicine Hack: A 10-Week Learning Community to Accelerate Telemedicine Implementation for Ambulatory Providers](#). More than 200,000 clinicians have tuned in for virtual sessions and specialist office hours covering telemedicine workflow, documentation, reimbursement, and best practices.

Project ECHO's impacts have reached the policy level as well. In 2016, the [Expanding Capacity for Health Outcomes Act](#), also known as the ECHO Act, was signed into law, requiring HHS to report on technology-enabled collaborative learning and capacity building models that connect specialists and primary care clinicians. Four states have gained [CMS approval](#) for Medicaid reimbursement for Project ECHO services, and policy work to improve Project ECHO's reach and financial [sustainability](#) is underway.

Other examples of AHRQ-supported telehealth work include the use of telehealth sessions to provide mental health treatment for elderly patients living in rural New York, which reduced emergency department visits by 20% and lowered costs by 25%¹⁵² and the use of interactive voice response to “close the feedback loop” and improve diagnostic quality (PI: E. Berner).¹⁵³ The later resulted in a patent for the *Clinical Documentation and Notification Application (CDNA)* used in the study and continued implementation in multiple clinical applications. Finally, a 2018-initiated project to identify factors that lead [patients to choose telemedicine](#) when the option is available to them aims to inform emerging telehealth policies. This research team (PI: M. Reed) referenced their aim to improve opportunities for patients to engage with clinicians via telehealth as a means of reducing the \$50 billion in opportunity costs spent for primary care visits by U.S. patients.¹⁵⁴

Electronic Health Records

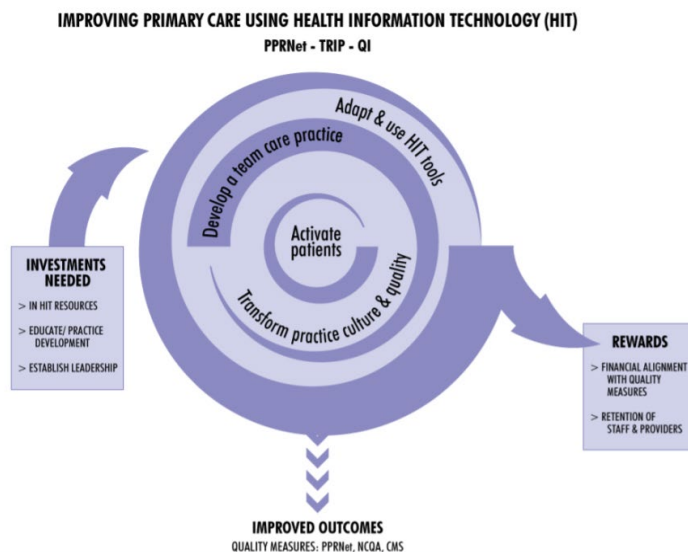
Between 2004 and 2010, when EHR adoption in primary care was on the rise, AHRQ funded numerous grants and contracts related to EHR implementation. A Wisconsin-based multidisciplinary team (human factors engineers, physicians, and researchers; PI’s: P. Carayon and B. Karsh), for example, analyzed practice workflow related to EHR implementation and use. This led to development of a toolkit designed to help small and medium primary care practices conduct pre-implementation workflow assessment.¹⁵⁵ Another R01 grantee team (PI: D. Bates) identified [EHR use and barriers](#) to adoption among Massachusetts primary care practices.¹⁵⁶ A substantially higher EHR usage rate (>80%) than the national average at the time was reported; however usage was variable and some functionality was described as poor (i.e., fewer than half of practices transmitted prescriptions electronically or used clinical decision support through their EHR systems). These data were presented at statewide, national, and international meetings^{157, 158} and informed subsequent implementation initiatives.

AHRQ has supported EHR-focused research studies targeting improved care for patients living with depression. In 2006, DARTNet PBRN initiated a series of AHRQ-funded studies uniquely linking EHR data, patient-reported outcomes, and health claims data. In one of the group’s projects, the addition of a point-of-care screening tool and prescription fulfillment data to the EHR improved patient outcomes.¹⁵⁹ The group also customized workflow for [depression screening](#) to each practice site, which enabled most DARTNet practices to maintain high screening rates even after AHRQ’s support ended. In 2013, AHRQ grantee Heather Anderson and colleagues developed, implemented, and assessed a EHR-based patient data collection and clinician feedback system (the [EffectRx Project](#)) to improve care for patients with depression in primary care.

Research on personal health record (PHR) integration in primary care has also been a focus of AHRQ’s investments. The use of PHRs resulted in patient-tailored preventive service planning¹⁶⁰ and increased medication safety in older adults.¹⁶¹ Another contribution to PHR came out of AHRQ’s patient safety work. Lynne Nemeth built upon *SO-TRIP* with an AHRQ-funded (R03) secondary data analysis of seven digital healthcare studies conducted by PPRNet investigators. One outcome of this work was a framework related to the use of HIT for primary care quality improvement. Informed by four main concepts: 1) developing a team care practice, 2) adapting and using HIT tools, 3) transforming the practice culture and quality, and 4) activating patients, this [framework](#) (Figure 14) organizes key components of HIT-driven quality improvement.

Figure 14. A Refined Framework Guiding Primary Care Improvement

Figure 1: PPRNet-TRIP QI: A Refined Framework Guiding Primary Care Improvement
 Acknowledgement: AHRQ R03HS018830 (Nemeth, PI)



This framework has been utilized to guide research and clinical practice, and is featured in a chapter of the Handbook of eHealth Evaluation which is dedicated to EHR evaluation in primary care.¹⁶²

In one such grant initiative, researchers evaluated challenges, workarounds, and solutions associated with EHR use in primary care practices that were integrating behavioral healthcare services.¹⁶³ Workarounds including duplicated or freestyle documentation, scanning of paper documents, and reliance on patient

recall were employed to address limitations in the EHRs' available templates, communication, and interoperability.

Clinical Decision Support

[Clinical Decision Support](#) (CDS) tools and systems provide timely information, typically at the point of care, to help inform decisions related to patient care, and between 2008 and 2019, 18% of awarded primary care grants used or studied decision support tools and processes that organize or prioritize information to allow clinicians to make care decisions in real time. AHRQ grantee [Jerry Osheroff](#) established the influential *CDS Five Rights Model* (Figure 15), which was used in the development of a guide to Improving Medication Use and Outcomes with Clinical Decision Support, numerous research projects and clinical tools, and has been implemented by EHR and Health IT companies.

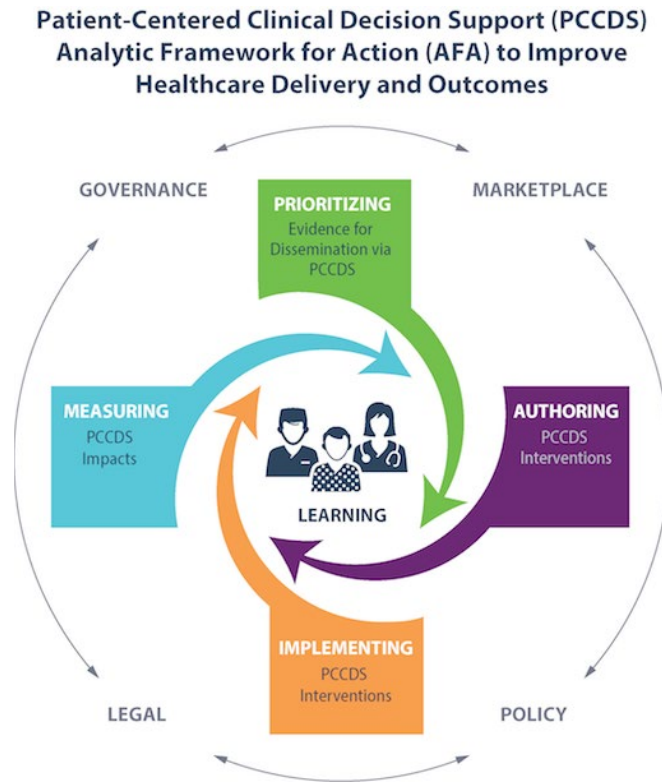
Figure 15. The Clinical Decision Support Five Rights Model

The CDS Five Rights model states that we can achieve CDS-supported improvements in desired healthcare outcomes if we communicate:
The right information : evidence-based, suitable to guide action, pertinent to the circumstance
To the right person : considering all members of the care team, including clinicians, patients, and their caretakers
In the right CDS intervention format : such as an alert, order set, or reference information to answer a clinical question
Through the right channel : for example, a clinical information system (CIS) such as an electronic medical record (EMR), personal health record (PHR), or a more general channel such as the Internet or a mobile device
At the right time in workflow : for example, at time of decision/action/need

AHRQ has funded a variety of initiatives to expand CDS utilization in primary care, including the development of multiple white papers, reports, and systematic reviews,¹⁶⁴⁻¹⁶⁶ the sponsorship of Town Hall meetings and [conferences](#), and the development of the [CDS Connect Project](#) (a web-based community providing a variety of CDS resources) and the [Patient-Centered Clinical Decision Support Learning Network](#) (PCCDS). The PCCDS produced an *Analytical Framework for Action* aimed at improving healthcare quality and outcomes via CDS (Figure 16). This framework informed numerous clinician and patient-facing CDS interventions and provided the foundation for the Patient-Centered

Outcomes Research Clinical Decision Support Learning Network, an online “home” for researchers, clinicians, professional societies, and others interested in CDS to openly collaborate and share knowledge.

Figure 16. Patient-Centered Clinical Decision Support Analytic Framework for Action



AHRQ has supported multiple other high-impact primary care CDS initiatives. Building on an AHRQ-supported project to identify challenges and barriers to CDS design and implementation,¹⁶⁷ AHRQ funded two 5-year demonstration contracts (2008 – 2013) to explore how to create high-quality CDS and deliver it at the point of care. The Clinical Decision Support Consortium (CDSC) (PI: B. Middleton, Brigham & Women’s Hospital) used a staged approach to develop logic, computer code, and a cloud-based platform to disseminate CDS for hypertension, cardiovascular disease, and diabetes throughout the U.S. The Guidelines Into Decision Support Program (GLIDES) (PI: R. Shipman, Yale University) developed CDS tools from evidence-based care guidelines. Both programs were integrated by medical professionals and EHR vendors throughout the U.S.

In 2009 to 2011, an AHRQ contract (PI: J. Osheroff) developed and evaluated “eRecommendation”, a CDS tool for integrating 45 USPSTF A and B recommendations and 12 Meaningful Use measures in primary care.^{168, 169} Outcomes of the work include the creation of the *Advancing Clinical Decision Support* and *Strategic Health IT Advanced Research* projects, which made eRecommendations available to the public and to EHR and CDS suppliers, who converted eRecommendations into locally useful CDS rules. An R21 grant was awarded to a Mayo Clinic team (PI: R. Chaudhry) to use a natural language processing CDS system to support cervical cancer screening and surveillance. The system was effective in improving overall screening rates and in improving surveillance rates for non-adherent high-risk patients.¹⁷⁰ As part of the *Accelerating Change and Transformation in Organizations and Networks (ACTION)* initiative, two teams ([MedStar Health Research Institute](#) and [RTI International](#)) were each awarded two-year \$3.7 million contracts in 2019 to develop interoperable CDS platforms for use with patients experiencing chronic pain. One objective of this work is to explore methodologies for identifying patients at highest risk of opioid overdose, a national crisis that leads to more than 125 deaths per day and an economic burden of \$78.5 billion annually in the U.S.

Health Information Exchange

[Health Information Exchange](#) (HIE) improves care coordination and patient safety by allowing doctors, nurses, pharmacists, other healthcare providers and patients to appropriately access and securely share a patient’s vital medical information electronically, improving the speed, quality, safety and cost of patient care. AHRQ is known for funding the first large-scale HIE implementations in the U.S. One notable grant project (\$1.5 million 2005 – 2009) focused on HIE took place in rural Nebraska ([PI: N. Shank](#)). The research team formed an incorporated operational entity to support HIE among critical access hospitals, primary care clinics, public health providers, and behavioral health providers and trained individuals and teams to use EHR and HIE. The project was not only successful in improving HIE in the region, but improved providers’ ratings of data access and increased understanding of technological and staff barriers to EHR and HIE in the region. Another primary care-based HIE study funded by AHRQ identified strengths and weaknesses of strategies for encouraging practices to participate in state-wide [HIE in Colorado](#). These and other AHRQ projects laid the foundation for national HIT efforts, including the CMS meaningful use program, the HRSA Health Center Controlled Networks Program (HCCN), and the Office of the National Coordinator (ONC) for Health IT grant program, which provided almost \$550 million in funding to U.S. states and territories.

FINANCING AND COST

Research on the financing and cost of primary care has been conducted across the range of primary care research topics, and 21% of primary care grants awarded between 2008 and 2019 dealt in some way with cost of implementation, payment bundling, or how patients pay for care. AHRQ’s Patient-Centered Medical Home (PCMH) work (described above) also included a funding announcement, “Estimating the Costs of Supporting Primary Care.” These Practice Transformation grants were funded to provide stakeholders with information about the costs of implementing and sustaining transformative primary care practice redesign. Grantees estimated the costs of primary care transformation using a variety of methods drawn from the fields of accounting, management, and econometrics. Many studies also estimated the costs of attaining and maintaining PCMH recognition. The research produced a *Practical Guide to Measuring the Costs of Primary Care Transformation*, which summarizes the methods used by grantees to measure the direct and indirect costs of transforming primary care and the advantages and disadvantages of each method. Other AHRQ research on primary care [financing](#) include the [impact of health IT](#) on primary care workflow and financial measures, the impact of telemedicine on provider networks, spending and utilization, financing the primary care workforce,¹³³ and how hospital-physician integration affects physician wage gaps in primary and specialty care.

PREVENTION

Prevention of disease and promotion of health behaviors is a core function of primary care. In fact, preventing disease in healthy people is the unique responsibility of primary care, yet most people do not receive all the appropriate high-priority clinical preventive services.¹⁷¹ As a result, [prevention](#) has been a constant part of the AHRQ primary care research portfolio, and many [prevention resources](#) have been developed over the years. Between 2008 and 2019, 17% of funded AHRQ grants addressed some aspect of prevention in primary care – testing comparative effectiveness, leveraging health IT, funding, workforce, and implementation. Examples of prevention-related primary care research included determining the optimal way to implement USPSTF guidelines for hypertension¹⁷² (PI: Kronish), use of her-based health reminders¹⁷³ (PI: Ralston), and the use of CDS to increase STI screening in adolescents in primary care¹⁷⁴ (PI: Aalsma).

AHRQ funded three [Research Centers for Excellence in Clinical Preventive Services](#) to focus on the delivery of preventive services in the clinical setting by conducting research projects seeking solutions to

the problems of underuse, overuse, and disparities in use of preventive services. The Center for Advancing Equity in Clinical Preventive Services at Northwestern University developed and tested interventions to reduce disparities in clinical preventive services by focusing on health literacy, health communication, quality improvement methods, and health information technology. The Research Center for Excellence in Clinical Preventive Services at the University of North Carolina focused on reducing patient harms by understanding and encouraging appropriate use of screening and conducting, disseminating research, and developing strategies to improve patient and provider decision making. The Center for Research in Implementation Science and Prevention (CRISP) at the University of Colorado explored methods to increase the use of preventive health services within primary healthcare settings to meet national public health goals. A separate award to help support, coordinate, and evaluate the impact of the centers was made to Abt Associates and the MacColl Center for Health Care Innovation, which resulted in a white paper, [*Bundling Clinical Preventive Services: A Review of Definitions and Concepts from the Literature*](#), which explores how the concept of bundling—that is, offering together—is used in the healthcare literature in the context of clinical preventive services.

In addition to direct research funding, other AHRQ activities in prevention have helped shape the direction of primary care research. The AHRQ EPC program provides the systematic reviews that underpin the NIH Office of Disease Prevention’s [Pathways to Prevention](#) (P2P) workshop program. P2P workshops identify research gaps in a selected area of prevention and move the field forward through an unbiased, evidence-based assessment of a complex public health issue. Although not all P2P topics are directed at stimulating primary care research, most – such as preventing youth suicide, appropriate use of drug therapies to prevent osteoporotic fractures, and the role of opioids in the treatment of chronic pain – are of great importance to primary care practices.

Another influence on primary care research is the [US Preventive Services Task Force](#) (USPSTF). The USPSTF issues practice recommendations on clinical preventive services, based on systematic evidence reviews commissioned by AHRQ. The recommendations and evidence reviews for the USPSTF have been important for developing the evidence base around prevention in primary care. The [Prevention TaskForce](#) (formerly ePSS) application for web and mobile devices is a tool designed to assist primary care clinicians in identifying the screening, counseling, and preventive medication services that are appropriate for their patients. Since 2011, the USPSTF has produced an [annual report to Congress](#) that identifies gaps in the evidence base for clinical preventive services and recommends priority areas for further examination. A & B recommended clinical preventive services are covered by private payers at no cost sharing to patients under Section 2713 of the Affordable Care Act. The 2019 report identified

specific questions within six high-priority topics affecting mental health, substance use, and violence prevention that need more research (see box). The USPSTF has also worked to make the recommendations more user-friendly¹⁷⁵ so that they can be implemented more effectively.

In addition to its annual report to Congress, the USPSTF also highlights evidence gaps in all of its recommendation statements – either as an “I statement” indicating the evidence is insufficient to make a recommendation for or against a preventive service, or in the “Research Needs and Gaps” section of recommendations. To help address the gaps in evidence, the NIH reviews the research gaps identified by the USPSTF and uses this information when developing future funding opportunities. For example, NIH is funding several projects on methods to identify elder abuse and the mistreatment of people with physical and mental disabilities, which USPSTF identified as a need in 2018. The Office of Disease Prevention conducts an annual survey of NIH-related research to address research gaps and maintains a list of all USPSTF “I” (insufficient evidence) statements on their Research Needs and Gaps [webpage](#) to encourage researchers to fill evidence gaps which could impact primary care.

**USPSTF High-Priority Evidence Gaps for Clinical Preventive Services
related to Mental Health and Substance Use
(9th Annual Report to Congress, 2019)**

1. Perinatal Depression: Preventive Interventions
 - a. Identify who is at increased risk of perinatal depression
 - b. Determine ways to improve the delivery of perinatal interventions
2. Unhealthy Alcohol Use in Adolescents and Adults: Screening and Behavioral Counseling Interventions
 - a. Assess effectiveness of screening for alcohol use in adolescents
 - b. Improve the delivery of alcohol use screening and counseling for adults
 - c. Examine whether different screening strategies for alcohol use are more effective in diverse populations
3. Tobacco Use Prevention and Cessation in Children and Adolescents: Primary Care Interventions
 - a. Identify effective ways to help youth quit using tobacco products
 - b. Evaluate interventions tailored specifically to prevent youth from starting to use and to help them quit using e-cigarettes
4. Illicit Drug Use, Including Nonmedical Use of Prescription Drug Use in Adolescents and Adults: Screening by Asking About Drug Use
 - a. Evaluate in adolescents the effectiveness of screening tools and interventions for illicit drug use
 - b. Identify the optimal interval to use screening tools for detecting illicit drug use in adults
 - c. Assess accuracy of screening tools that ask questions to help detect nonmedical use of prescription drugs, including opioids
5. Intimate Partner Violence, Elder Abuse, and Abuse of Vulnerable Adults: Screening

- a. Evaluate screening for elder abuse and abuse of vulnerable adults
 - b. Assess screening and interventions for intimate partner violence in men
 - c. Determine the most effective components of ongoing support services
6. Child Maltreatment: Interventions
- a. Evaluate key outcomes consistently in studies, because using very different outcomes complicates a clear overall assessment of whether these interventions work
 - b. Include additional populations in studies (e.g., families with substance abuse in the home or limited access to social services)
 - c. Examine the extent and severity of unintended harms from risk assessment and preventive interventions

SUMMARY

In 1990, ACHPR laid out an agenda for primary care research that envisaged safe, equitable, high-quality primary care for all Americans. Some investments in primary care research involved contract work and the commissioning of evaluations and reports, some came in the form of intramural projects, and most supported grants awarded to extramural research teams throughout the Nation.

Between 1990 and 2000, AHRQ's primary care research portfolio has:

- Led to over 1000 publications on primary care research from grants funded between 2008 and 2019
- Supported the first demonstration of the ECHO model in 2009
- Cataloged dozens of tools and resources for primary care transformation
- Generated evidence for realistic steps to reduce clinician burnout
- Supported development of the *Six Building Blocks* model for opioid management in primary care
- Invested \$112 million to help over 1,500 small and medium-sized primary care practices across the country with using the latest evidence to improve the ABCS of heart disease prevention
- Released a 32 module *Primary Care Practice Facilitation Curriculum* and *How to Guide* for running a practice facilitation program
- Produced EvidenceNOW's curated Tools for Change
- Led to creation of an interactive Playbook for the integration of behavioral health and primary care
- Increased access to Medication-Assisted Treatment to over 20,000 individuals struggling with opioid addiction in rural areas
- Advanced the latest methods to evaluate and refine new models of primary care delivery
- Developed models for workforce staffing configurations for primary care
- Disseminated white papers to policy- and decision-makers on team-based care, use of health IT for quality improvement, care coordination, engaging patients and families, and many more
- Supported the expansion of PBRN's
- Initiated a more targeted focus on equity and priority populations
- Increased digital healthcare research to improve quality and safety
- Developed and maintained a [website](#) to house research, funding opportunities, and practical tools and resources for primary care researchers.

Primary care has been described as the backbone of the healthcare system.³ In the U.S., more than half of healthcare visits are primary care visits, and patients who have a primary care relationship have better health outcomes.¹⁷⁶ Primary care research is vital to advancing primary care. AHRQ has sustained a commitment to primary care research for 30 years, across three decades and four administrations, despite the absence of a dedicated budget for primary care research. The Agency has worked steadily to invest in research to revolutionize primary care *organization, workforce, quality and safety, digital healthcare, financing and cost, and prevention*. Significant contributions to building *research infrastructure*, developing *research methods*, and generating *data for research* have also been a constant for the past 30 years. These investments have resulted in impacts at the level of research, policy, programs, clinical practice, and health outcomes. Many projects were strategically designed to build upon and leverage previous Agency research, reflect collaborative and trans-agency initiatives, and laid the groundwork for wider exploration and implementation. The goals of primary care research have remained constant since the publication of AHCPR's 1990 research agenda and the research questions have remained largely unchanged – how can we provide safe, equitable, high-quality primary care for all Americans? Yet, the complexities involved with answering these questions have become so much greater. AHRQ stands ready to meet this dynamic, ever-evolving challenge.

REFERENCES

1. Institute of Medicine, Committee on the Future of Primary Care. Primary care: America's health in a new era. Washington, DC: National Academies Press; 1996. <https://doi.org/10.17226/5152>.
2. National Academies of Sciences, Engineering, and Medicine. Implementing high-quality primary care: rebuilding the foundation of health care. Washington, DC: National Academies Press; 2021. <https://doi.org/10.17226/25983>.
3. Starfield B, Shi L, Macinko J. Contribution of primary care to health systems and health. *Milbank Q*. 2005;83(3):457-502. doi: 10.1111/j.1468-0009.2005.00409.x. PMID: 16202000.
4. Nutting PA. Conference summary report: a research agenda for primary care: summary report of a conference. AHCPR 91-08. Agency for Healthcare Policy and Research; 1991.
5. Eisenberg JM. Putting research to work: reporting and enhancing the impact of health services research. *Health Serv Res*. 2001 Jun 36(2):x-xvii. PMID: 11409822.
6. Buykx P, Humphreys J, Wakerman J, et al. 'Making evidence count': a framework to monitor the impact of health services research. *Aust J Rural Health*. 2012 Apr;20(2):51-8. doi: 10.1111/j.1440-1584.2012.01256.x. PMID: 22435764.
7. Kuruvilla S, Mays N, Pleasant A, et al. Describing the impact of health research: a Research Impact Framework. *BMC Health Serv Res*. 2006 Oct 18;6(1):134. doi: 10.1186/1472-6963-6-134. PMID: 17049092.
8. Centers for Disease Control. Description of the Science Impact Framework. Last updated Oct 11, 2017. <https://www.cdc.gov/od/science/impact/framework.html>.
9. Mendel P, Gidengil CA, Tomoiaia-Cotisel A, et al. Health services and primary care research study. Comprehensive Report. Santa Monica, CA: RAND Corporation; 2021. https://www.rand.org/pubs/research_reports/RRA1503-1.html.
10. Donovan C, Hanney S. The 'Payback Framework' explained. *Research Evaluation*. 2011 Sep;20(3):181-3. doi: 10.3152/095820211x13118583635756.
11. Lavis J, Ross S, McLeod C, et al. Measuring the impact of health research. *J Health Serv Res Policy*. 2003 Jul;8(3):165-70. doi: 10.1258/135581903322029520. PMID: 12869343.
12. Stryer D, Tunis S, Hubbard H, et al. The outcomes of outcomes and effectiveness research: impacts and lessons from the first decade. *Health Serv Res*. 2000 Dec;35(5 Pt 1):977-93. PMID: 11130807.
13. Lanier D, Clancy C. Primary care research: current challenges, future needs. *J Fam Pract*. 1997 May;44(5):434-8. PMID: 9152252.
14. Eisenberg JM. AHCPR focuses on information for health care decision makers. *Health Serv Res*. 1998 Oct;33(4 Pt 1):767-81. PMID: 9776935.
15. Katerndahl D, Crabtree B. Creating innovative research designs: the 10-year Methodological Think Tank case study. *Ann Fam Med*. 2006 Sep-Oct;4(5):443-9. doi: 10.1370/afm.549. PMID: 17003146.

16. Crabtree BF, Miller WL, Addison RB, et al., eds. Exploring collaborative research in primary care. 1st ed. Thousand Oaks, Calif.: Sage Publications; 1994.
17. Cohen DJ, Balasubramanian BA, Gordon L, et al. A national evaluation of a dissemination and implementation initiative to enhance primary care practice capacity and improve cardiovascular disease care: the ESCALATES study protocol. *Implement Sci.* 2016 Jun 29;11(1):86. doi: 10.1186/s13012-016-0449-8. PMID: 27358078.
18. Westfall JM, Mold J, Fagnan L. Practice-based research--"Blue Highways" on the NIH roadmap. *JAMA.* 2007 Jan 24;297(4):403-6. doi: 10.1001/jama.297.4.403. PMID: 17244837.
19. Green LA, Hickner J. A short history of primary care practice-based research networks: from concept to essential research laboratories. *J Am Board Fam Med.* 2006;19(1):1-10. doi: 10.3122/jabfm.19.1.1. PMID: 16491999.
20. Flaherty EG, Sege RD, Griffith J, et al. From suspicion of physical child abuse to reporting: primary care clinician decision-making. *Pediatrics.* 2008 Sep;122(3):611-9. doi: 10.1542/peds.2007-2311. PMID: 18676507.
21. Meyers D. A tribute to Dr. David Lanier. *J Am Board Fam Med.* 2011 Sep-Oct;24(5):494-5. doi: 10.3122/jabfm.2011.05.110135. PMID: 21900431.
22. Baldwin LM, Keppel GA, Davis A, et al. Developing a practice-based research network by integrating quality improvement: challenges and ingredients for success. *Clin Transl Sci.* 2012 Aug;5(4):351-5. doi: 10.1111/j.1752-8062.2012.00405.x. PMID: 22883614.
23. Dolor RJ, Schmit KM, Graham DG, et al. Guidance for researchers developing and conducting clinical trials in practice-based research networks (PBRNs). *J Am Board Fam Med.* 2014 Nov-Dec;27(6):750-8. doi: 10.3122/jabfm.2014.06.140166. PMID: 25381071.
24. Krist AH, Glenn BA, Glasgow RE, et al. Designing a valid randomized pragmatic primary care implementation trial: the my own health report (MOHR) project. *Implement Sci.* 2013 Jun 25;8:73. doi: 10.1186/1748-5908-8-73. PMID: 23799943.
25. Elder WG, Munk N. Using the Pragmatic-Explanatory Continuum Indicator Summary (PRECIS) model in clinical research: application to refine a practice-based research network (PBRN) study. *J Am Board Fam Med.* 2014 Nov-Dec;27(6):846-54. doi: 10.3122/jabfm.2014.06.140042. PMID: 25381083.
26. Dolor RJ, Campbell-Voytal K, Daly J, et al. Practice-based Research Network Research Good Practices (PRGPs): summary of recommendations. *Clin Transl Sci.* 2015 Dec;8(6):638-46. doi: 10.1111/cts.12317. PMID: 26296309.
27. Campbell-Voytal K, Daly JM, Nagykaladi ZJ, et al. Team science approach to developing consensus on research good practices for practice-based research networks: a case study. *Clin Transl Sci.* 2015 Dec;8(6):632-7. doi: 10.1111/cts.12363. PMID: 26602516.
28. Bertram S, Graham D, Kurland M, et al. Communication is the key to success in pragmatic clinical trials in practice-based research networks (PBRNs). *J Am Board Fam Med.* 2013 Sep-Oct;26(5):571-8. doi: 10.3122/jabfm.2013.05.120352. PMID: 24004709.

29. Holroyd-Leduc JM, Lorenzetti D, Straus SE, et al. The impact of the electronic medical record on structure, process, and outcomes within primary care: a systematic review of the evidence. *J Am Med Inform Assoc.* 2011 Nov-Dec;18(6):732-7. doi: 10.1136/amiajnl-2010-000019. PMID: 21659445.
30. Singh H, Graber M. Reducing diagnostic error through medical home-based primary care reform. *JAMA.* 2010 Jul 28;304(4):463-4. doi: 10.1001/jama.2010.1035. PMID: 20664048.
31. deGruy F. PBRN conference a success. *Ann Fam Med.* 2012 Nov-Dec;10(6):577-8. doi: 10.1370/afm.1458. PMID: 23149541.
32. Tapp H. The changing face of primary care research and Practice-Based Research Networks (PBRNs) in light of the COVID-19 pandemic. *J Am Board Fam Med.* 2020 Sep-Oct;33(5):645-9. doi: 10.3122/jabfm.2020.05.200400. PMID: 32989057.
33. DeVoe JE, Likumahuwa-Ackman SM, Angier HE, et al. A Practice-Based Research Network (PBRN) roadmap for evaluating COVID-19 in community health centers: a report from the OCHIN PBRN. *J Am Board Fam Med.* 2020 Sep-Oct;33(5):774-8. doi: 10.3122/jabfm.2020.05.200053. PMID: 32989072.
34. Westfall JM, Roper R, Gaglioti A, et al. Practice-based research networks: strategic opportunities to advance implementation research for health equity. *Ethn Dis.* 2019;29(suppl 1):113-8. doi: 10.18865/ed.29.S1.113. PMID: 30906158.
35. Brown JA, Serrato, C.A., Hugh, M., Kanter, M.H., Spritzer, K.L., & Hays, R.D. . Effect of a post-paid incentive on response rates to a web-based survey. *Surv Pract.* 2016 Jan 31;9(1):1-7. doi: 10.29115/SP-2016-0001.
36. Bergeson SC, Gray J, Ehrmantraut LA, et al. Comparing web-based with mail survey administration of the Consumer Assessment of Healthcare Providers and Systems (CAHPS®) Clinician and Group Survey. *Prim Health care.* 2013 Apr 15;3:1000132. doi: 10.4172/2167-1079.1000132. PMID: 24078901.
37. Chung S, Mujal G, Liang L, et al. Racial/ethnic differences in reporting versus rating of healthcare experiences. *Medicine.* 2018 Dec;97(50):e13604. doi: 10.1097/MD.00000000000013604. PMID: 30558033.
38. Keyes MA. CONQUEST 2.0: an emerging clinical performance measurement tool. *J Healthc Qual.* 2000 May-Jun;22(3):29-36. doi: 10.1111/j.1945-1474.2000.tb00125.x. PMID: 11066917.
39. Institute of Medicine, Committee on Quality of Health Care in America. *Crossing the quality chasm: a new health system for the 21st century.* Washington (DC); 2001. <https://doi.org/10.17226/10027>.
40. Friedman A, Howard J, Shaw EK, et al. Facilitators and barriers to care coordination in patient-centered medical homes (PCMHs) from coordinators' perspectives. *J Am Board Fam Med.* 2016 Jan-Feb;29(1):90-101. doi: 10.3122/jabfm.2016.01.150175. PMID: 26769881.
41. McDonald K, Sundaram V, Bravata D, et al. *Closing the Quality Gap: A Critical Analysis of Quality Improvement Strategies (Vol. 7: Care Coordination).* Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); Jun 2007 <https://www.ncbi.nlm.nih.gov/books/NBK44015/>.
42. Ritchie CS, Houston TK, Richman JS, et al. The E-Coach technology-assisted care transition system: a pragmatic randomized trial. *Transl Behav Med.* 2016 Sep;6(3):428-37. doi: 10.1007/s13142-016-0422-8. PMID: 27339715.

43. Field TS, Garber L, Gagne SJ, et al. Technological resources and personnel costs required to implement an automated alert system for ambulatory physicians when patients are discharged from hospitals to home. *Inform Prim Care*. 2012;20(2):87-93. doi: 10.14236/jhi.v20i2.29. PMID: 23710773.
44. Schnipper JL. Electronic medication adherence reporting and feedback during care transitions - final report. (Prepared by Brigham and Women's Hospital under Grant No. R21 HS024587). . Rockville, MD: Agency for Healthcare Research and Quality; 2019. <https://digital.ahrq.gov/ahrq-funded-projects/electronic-medication-adherence-reporting-and-feedback-during-care-transitions>.
45. Nkoy F, Fassel B, Stone B, et al. Improving pediatric asthma care and outcomes across multiple hospitals. *Pediatrics*. 2015 Dec;136(6):e1602-10. doi: 10.1542/peds.2015-0285. PMID: 26527553.
46. Okun S, Schoenbaum SC, Andrews D, et al. Patients and health care teams forging effective partnerships. *NAM Perspectives*. Discussion Paper. Washington, DC: Institute of Medicine; 2014. <https://nam.edu/perspectives-2014-patients-and-health-care-teams-forging-effective-partnerships/>.
47. King HB BJ, Baker DP, et al. T. TeamSTEPPS™: Team strategies and tools to enhance performance and patient safety. In: Henriksen K, Battles JB, Keyes MA, Grady ML, eds. *Advances in Patient Safety: New Directions and Alternative Approaches (Vol 3: Performance and Tools)*. Rockville, MD: Agency for Healthcare Research and Quality; 2008. <https://www.ncbi.nlm.nih.gov/books/NBK43686/>.
48. Parker AL, Forsythe LL, Kohlmorgen IK. TeamSTEPPS® : an evidence-based approach to reduce clinical errors threatening safety in outpatient settings: an integrative review. *J Healthc Risk Manag*. 2019 Apr;38(4):19-31. doi: 10.1002/jhrm.21352. PMID: 30212604.
49. Schottenfeld L, Petersen D, Peikes D, et al. Creating patient-centered team-based primary care. AHRQ Publication No. 16-0002-EF. Rockville, MD: Agency for Healthcare Research and Quality; 2016. <https://archive.ahrq.gov/ncepcr/tools/PCMH/creating-patient-centered-team-based-primary-care-white-paper.pdf>.
50. Parchman ML, Von Korff M, Baldwin L-M, et al. Primary care clinic re-design for prescription opioid management. *J Am Board Fam Med*. 2017 Jan 2;30(1):44-51. doi: 10.3122/jabfm.2017.01.160183. PMID: 28062816.
51. Parchman ML, Penfold RB, Ike B, et al. Team-based clinic redesign of opioid medication management in primary care: effect on opioid prescribing. *Ann Fam Med*. 2019 Jul;17(4):319-25. doi: 10.1370/afm.2390. PMID: 31285209.
52. Ike B, Baldwin L-M, Sutton S, et al. Staff and clinician work-life perceptions after implementing systems-based improvements to opioid management. *J Am Board Fam Med*. 2019;32(5):715-23. doi: 10.3122/jabfm.2019.05.190027. PMID: 31506367.
53. Shoemaker-Hunt SJ, Evans L, Swan H, et al. Study protocol for evaluating Six Building Blocks for opioid management implementation in primary care practices. *Implement Sci Commun*. 2020 Feb 26;1:16. doi: 10.1186/s43058-020-00008-6. PMID: 32885178.
54. Ike B, Baldwin L-M, Parchman M, et al. The Six Building Blocks: A team-based approach to improving opioid management in primary care how-to-implement toolkit. (Prepared by Abt Associates under Contract No. HHSP233201500013I). Rockville, MD: Agency for Healthcare Research and Quality; 2021. <https://www.ahrq.gov/sites/default/files/wysiwyg/patient-safety/settings/ambulatory/6bb-toolkit-overview-rev.pdf>.

55. Shoemaker SJ, Parchman ML, Fuda KK, et al. A review of instruments to measure interprofessional team-based primary care. *Journal Interprofessional Care*. 2016 Jul;30(4):423-32. doi: 10.3109/13561820.2016.1154023. PMID: 27212003.
56. Hysong SJ, Amspoker AB, Hughes AM, et al. Impact of team configuration and team stability on primary care quality. *Implement Sci*. 2019 Mar 6;14(1):22. doi: 10.1186/s13012-019-0864-8. PMID: 30841926.
57. Farrell TW, Tomoia-Cotisel A, Scammon DL, et al. Impact of an integrated transition management program in primary care on hospital readmissions. *J Healthc Qual*. 2015 Jan-Feb;37(1):81-92. doi: 10.1097/01.Jhq.0000460119.68190.98. PMID: 26042380.
58. Egger MJ, Day J, Scammon DL, et al. Correlation of the care by design primary care practice redesign model and the principles of the patient-centered medical home. *J Am Board Fam Med*. 2012 Mar-Apr;25(2):216-23. doi: 10.3122/jabfm.2012.02.110159. PMID: 22403203.
59. Dorr DA, Wilcox A, McConnell KJ, et al. Productivity enhancement for primary care providers using multicondition care management. *Am J Manag Care*. 2007 Jan;13(1):22-8. PMID: 17227200.
60. Wilcox AB, Dorr DA, Burns L, et al. Physician perspectives of nurse care management located in primary care clinics. *Care Manag J*. 2007;8(2):58-63. doi: 10.1891/152109807780845573. PMID: 17595923.
61. Dorr DA, Wilcox A, Jones S, et al. Care management dosage. *J Gen Intern Med*. 2007 Jun;22(6):736-41. doi: 10.1007/s11606-007-0138-z. PMID: 17415620.
62. Dorr DA, Wilcox AB, Brunner CP, et al. The effect of technology-supported, multidisease care management on the mortality and hospitalization of seniors. *J Am Geriatr Soc*. 2008 Dec;56(12):2195-202. doi: 10.1111/j.1532-5415.2008.02005.x. PMID: 19093919.
63. Holtrop JS, Luo Z, Alexanders L. Inadequate reimbursement for care management to primary care offices. *J Am Board Fam Med*. 2015 Mar-Apr;28(2):271-9. doi: 10.3122/jabfm.2015.02.140207. PMID: 25748769.
64. Annis AM, Holtrop JS, Tao M, et al. Comparison of provider and plan-based targeting strategies for disease management. *Am J Manag Care*. 2015 May;21(5):344-51. PMID: 26167701.
65. Luo Z, Chen Q, Annis AM, et al. A comparison of health plan- and provider-delivered chronic care management models on patient clinical outcomes. *J Gen Intern Med*. 2016 Jul;31(7):762-70. doi: 10.1007/s11606-016-3617-2. PMID: 26951287.
66. Holtrop JS, Potworowski G, Green LA, et al. Analysis of novel care management programs in primary care: an example of mixed methods in health services research. *Journal of Mixed Methods Research*. 2019 Jan;13(1):85-112. doi: 10.1177/1558689816668689.
67. Holtrop JS, Potworowski G, Fitzpatrick L, et al. Effect of care management program structure on implementation: a normalization process theory analysis. *BMC Health Serv Res*. 2016 Aug 15;16(a):386. doi: 10.1186/s12913-016-1613-1. PMID: 27527614.
68. Chang H-C, Chung H, Tao M, et al. A comparison of care management delivery models on the trajectories of medical costs among patients with chronic diseases: 4-year follow-up results. *Health*

- Services and Outcomes Research Methodology. 2016 Dec;16(4):234-55. doi: 10.1007/s10742-016-0160-x.
69. Tomoaia-Cotisel A, Farrell TW, Solberg LI, et al. Implementation of care management: an analysis of recent AHRQ research. *Med Care Res Rev*. 2018 Feb;75(1):46-65. doi: 10.1177/1077558716673459. PMID: 27789628.
70. Taylor EF, Machta RM, Meyers DS, et al. Enhancing the primary care team to provide redesigned care: the roles of practice facilitators and care managers. *Ann Fam Med*. 2013 Jan-Feb;11(1):80-3. doi: 10.1370/afm.1462. PMID: 23319510.
71. Green LA, Graham R, Bagley B, et al. Task Force 1. Report of the Task Force on Patient Expectations, Core Values, Reintegration, and the new model of family medicine. *Ann Fam Med*. 2004 Mar 1;2(suppl 1):s33-s50. doi: 10.1370/afm.134.
72. Stange KC, Miller WL, Nutting PA, et al. Context for understanding the National Demonstration Project and the patient-centered medical home. *Ann Fam Med*. 2010 May;8(suppl 1):s2-s8. doi: 10.1370/afm.1110. PMID: 20530391.
73. Rittenhouse DR, Thom DH, Schmittiel JA. Developing a policy-relevant research agenda for the patient-centered medical home: a focus on outcomes. *J Gen Intern Med*. 2010 Jun;25(6):593-600. doi: 10.1007/s11606-010-1289-x. PMID: 20467908.
74. McNellis RJ, Genevro JL, Meyers DS. Lessons learned from the study of primary care transformation. *Ann Fam Med*. 2013 May-Jun;11(suppl 1):s1-s5. doi: 10.1370/afm.1548. PMID: 23690378.
75. Phillips RL, Jr., Kaufman A, Mold JW, et al. The primary care extension program: a catalyst for change. *Ann Fam Med*. 2013 Mar-Apr;11(2):173-8. doi: 10.1370/afm.1495. PMID: 23508605.
76. Kaufman A, Dickinson WP, Fagnan LJ, et al. The role of health extension in practice transformation and community health improvement: lessons from 5 case studies. *Ann Fam Med*. 2019 Aug 12;17(suppl 1):s67-s72. doi: 10.1370/afm.2409. PMID: 31405879.
77. Phillips RL, Jr., Cohen DJ, Kaufman A, et al. Facilitating practice transformation in frontline health care. *Ann Fam Med*. 2019;17(suppl 1):s2-s5. doi: 10.1370/afm.2439. PMID: 31405869.
78. Fleming NS, da Graca B, Ogola GO, et al. Costs of transforming established primary care practices to patient-centered medical homes (PCMHs). *J Am Board Fam Med*. 2017 Jul-Aug;30(4):460-71. doi: 10.3122/jabfm.2017.04.170039. PMID: 28720627.
79. Shao H, Brown L, Diana ML, et al. Estimating the costs of supporting safety-net transformation into patient-centered medical homes in post-Katrina New Orleans. *Medicine*. 2016 Sep;95(39):e4990. doi: 10.1097/md.0000000000004990. PMID: 27684855.
80. Wasserman M, Berninger A, Gerteis J. Estimating the costs of primary care transformation: a practical guide and synthesis report. (Prepared by Abt Associates under Contract No. HHS290-2010-00004-I Task Order No. 10). AHRQ Publication No. 15-0066-3-EF. Rockville, MD: Agency for Healthcare Research and Quality; 2015. <https://www.ahrq.gov/ncepcr/reports/cost-guide/index.html>.
81. Butler M, Kane RL, McAlpine D, et al. Integration of mental health/substance abuse and primary care. *Evid Rep Technol Assess (Full Rep)*. 2008 Nov(173):1-362. PMID: 19408966.

82. Carey TS, Crotty KA, Morrissey JP, et al. Future research needs for the integration of mental health/substance abuse and primary care. Future Research Needs Paper No 3. Rockville (MD): Agency for Healthcare Research and Quality (US); Sep 2010. <https://www.ncbi.nlm.nih.gov/books/NBK51247/>.
83. Miller B, Kessler R, Peek C, et al. A national agenda for research in collaborative care: papers from the collaborative care research network research development conference. AHRQ Publication No. 11-0067. Rockville, MD: Agency for Healthcare Research and Quality; 2011. <https://archive.ahrq.gov/research/findings/final-reports/collaborativecare/collabcare.pdf>.
84. Peek C, National Integration Academy Council. Lexicon for behavioral health and primary care integration: concepts and definitions developed by expert consensus. AHRQ 13-IP001-EF. Rockville, MD: Agency for Healthcare Research and Quality; 2013. <https://integrationacademy.ahrq.gov/sites/default/files/2020-06/Lexicon.pdf>.
85. Peek C. Journey toward a lexicon. AHRQ Publication No. 13 IP001-2-EF. Rockville, MD: Agency for Healthcare Research and Quality; 2013.
86. Anderson G. Chronic care: making the case for ongoing care. Princeton, NJ: Robert Wood Johnson Foundation; 2010. <https://www.rwjf.org/content/dam/farm/reports/reports/2010/rwjf54583>.
87. Ashman JJ, Beresovsky V. Multiple chronic conditions among US adults who visited physician offices: data from the National Ambulatory Medical Care Survey, 2009. *Prev Chronic Dis.* 2013 Apr 25;10:E64. doi: 10.5888/pcd10.120308. PMID: 23618544.
88. Goodman RA, Parekh AK, Koh HK. Toward a more cogent approach to the challenges of multimorbidity. *Ann Fam Med.* 2012 Mar-Apr;10(2):100-1. doi: 10.1370/afm.1391. PMID: 22412000.
89. Multiple chronic conditions—a strategic framework: optimum health and quality of life for individuals with multiple chronic conditions. Washington, DC: U.S. Department of Health and Human Services; December 2010. https://www.hhs.gov/sites/default/files/ash/initiatives/mcc/mcc_framework.pdf.
90. Parekh AK, Meyers DS. Foreword. *Med Care.* 2014 Mar;52(Suppl 3):S1-S2. doi: 10.1097/mlr.0000000000000094. PMID: 24561747.
91. Grembowski D, Schaefer J, Johnson KE, et al. A conceptual model of the role of complexity in the care of patients with multiple chronic conditions. *Med Care.* 2014 Mar;52(suppl 3):S7-S14. doi: 10.1097/MLR.0000000000000045. PMID: 24561762.
92. Gerteis J ID, Deitz D, LeRoy L, Ricciardi R, Miller T, Basu J. Multiple chronic conditions chartbook. AHRQ Pub. No. 14-0038. Rockville,MD: Agency for Healthcare Research and Quality; April 2014.
93. Maciejewski ML, Hammill BG, Voils CI, et al. Prescriber continuity and medication availability in older adults with cardiometabolic conditions. *SAGE Open Med.* 2018 Feb 6;6:2050312118757388. doi: 10.1177/2050312118757388. PMID: 29449946.
94. Montori VM, Hargraves I, McNellis RJ, et al. The care and learn model: a practice and research model for improving healthcare quality and outcomes. *J Gen Intern Med.* 2019 Jan;34(1):154-8. doi: 10.1007/s11606-018-4737-7. PMID: 30430403.

95. Fullard E. Extending the roles of practice nurses and facilitators in preventing heart disease. *Practitioner*. 1987 Oct 8;231(1436):1283-6. PMID: 3505021.
96. Nagykaldi Z, Mold JW, Aspy CB. Practice facilitators: a review of the literature. *Fam Med*. 2005 Sep;37(8):581-8. PMID: 16145629.
97. Davis MM, Nagykaldi Z, Lipman PD, et al. First international conference on practice facilitation: a success! *Ann Fam Med*. 2018 May;16(3):274-5. doi: 10.1370/afm.2252.
98. Meyers D, Miller T, Genevro J, et al. EvidenceNOW: balancing primary care implementation and implementation research. *Ann Fam Med*. 2018 Apr;16(suppl 1):S5-S11. doi: 10.1370/afm.2196. PMID: 29632219.
99. Rui P, Hing E, Okeyode T. National Ambulatory Medical Care Survey: 2014 State and National Summary Tables.; 2014. https://www.cdc.gov/nchs/ahcd/web_tables.htm#2014.
100. Casalino LP. Technical assistance for primary care practice transformation: free help to perform unpaid labor? *Ann Fam Med*. 2018 Apr;16(Suppl 1):S12-S5. doi: 10.1370/afm.2226. PMID: 29632220.
101. Ono SS, Crabtree BF, Hemler JR, et al. Taking innovation to scale in primary care practices: the functions of health care extension. *Health Aff*. 2018 Feb;37(2):222-30. doi: 10.1377/hlthaff.2017.1100. PMID: 29401016.
102. McHugh M, Brown T, Liss DT, et al. Qualitative evaluation of a cardiovascular quality improvement programmereveals sizable data inaccuracies in small primary care practices. *BMJ Open Quality*. 2019 Nov 27;8(4):e000702. doi: 10.1136/bmjoq-2019-000702. PMID: 31803852.
103. Ahmad FS, Rasmussen LV, Persell SD, et al. Challenges to electronic clinical quality measurement using third-party platforms in primary care practices: the healthy hearts in the heartland experience. *JAMIA Open*. 2019 Dec;2(4):423-8. doi: 10.1093/jamiaopen/ooz038. PMID: 32025638.
104. Liss DT, Peprah YA, Brown T, et al. Using electronic health records to measure quality improvement efforts: findings from a large practice facilitation initiative. *Jt Comm J Qual Patient Saf*. 2020 Jan;46(1):11-7. doi: 10.1016/j.jcjq.2019.09.006. PMID: 31704159.
105. Hemler JR, Hall JD, Cholan RA, et al. Practice facilitator strategies for addressing electronic health record data challenges for quality improvement: EvidenceNOW. *J Am Board Fam Med*. 2018 May-Jun;31(3):398-409. doi: 10.3122/jabfm.2018.03.170274. PMID: 29743223.
106. Slutsky J, Atkins D, Chang S, et al. AHRQ series paper 1: comparing medical interventions: AHRQ and the effective health-care program. *J Clin Epidemiol*. 2010 May;63(5):481-3. doi: 10.1016/j.jclinepi.2008.06.009. PMID: 18834715.
107. Koh HK, Brach C, Harris LM, et al. A proposed 'health literate care model' would constitute a systems approach to improving patients' engagement in care. *Health Aff*. 2013 Feb;32(2):357-67. doi: 10.1377/hlthaff.2012.1205. PMID: 23381529.
108. Hargraves IG, Fournier AK, Montori VM, et al. Generalized shared decision making approaches and patient problems. Adapting AHRQ's SHARE approach for purposeful SDM. *Patient Educ Couns*. 2020 Oct;103(10):2192-9. doi: 10.1016/j.pec.2020.06.022. PMID: 32636085.

109. Institute of Medicine Committee on Quality of Health Care in A. In: Kohn LT, Corrigan JM, Donaldson MS, eds. *To Err is Human: Building a Safer Health System*. Washington (DC): National Academies Press (US)

Copyright 2000 by the National Academy of Sciences. All rights reserved.; 2000.

110. Wessell AM, Litvin C, Jenkins RG, et al. Medication prescribing and monitoring errors in primary care: a report from the Practice Partner Research Network. *Qual Saf Health Care*. 2010 Oct;19(5):e21. doi: 10.1136/qshc.2009.034678. PMID: 20413615.

111. Nemeth LS, Wessell AM. Improving medication safety in primary care using electronic health records. *Journal of Patient Safety*. 2010 Dec;6(4):238-43. doi: 10.1097/pts.0b013e3181fe401f. PMID: 21500611.

112. Nemeth LS, Ornstein SM, Jenkins RG, et al. Implementing and evaluating electronic standing orders in primary care practice: a PPRNet study. *J Am Board Fam Med*. 2012 Sep-Oct;25(5):594-604. doi: 10.3122/jabfm.2012.05.110214. PMID: 22956695.

113. Ornstein SM, Nemeth LS, Nietert PJ, et al. Learning from primary care meaningful use exemplars. *J Am Board Fam Med*. 2015 May-Jun;28(3):360-70. doi: 10.3122/jabfm.2015.03.140219. PMID: 25957369.

114. Litvin CB, Nietert PJ, Jenkins RG, et al. Translating CKD research into primary care practice: a group-randomized study. *J Gen Intern Med*. 2020 May;35(5):1435-43. doi: 10.1007/s11606-019-05353-4. PMID: 31823314.

115. Rubin HR, Pronovost P, Diette GB. From a process of care to a measure: the development and testing of a quality indicator. *Int J Qual Health Care*. 2001 Dec;13(6):489-96. doi: 10.1093/intqhc/13.6.489. PMID: 11769752.

116. Pronovost PJ, Miller MR, Dorman T, et al. Developing and implementing measures of quality of care in the intensive care unit. *Curr Opin Crit Care*. 2001 Aug;7(4):297-303. doi: 10.1097/00075198-200108000-00014. PMID: 11571429.

117. Pitts SI, Maruthur NM, Luu NP, et al. Implementing the Comprehensive Unit-Based Safety Program (CUSP) to improve patient safety in an academic primary care practice. *Jt Comm J Qual Patient Saf*. 2017 Nov;43(11):591-7. doi: 10.1016/j.jcjq.2017.06.006. PMID: 29056179.

118. Preventable readmissions: Conceptual framework to rethink the role of primary care. Executive summary. (Prepared by John Snow, Inc., under Contract No. HHSP2332015000191/HHSP23337002T). AHRQ Publication No. 20-0035-1-EF. Rockville, MD: Agency for Healthcare Research and Quality; March 2020. <https://www.ahrq.gov/sites/default/files/wysiwyg/patient-safety/rev-preventablereadm-primcare-es.pdf>.

119. Sweigart LI, Umoren RA, Scott PJ, et al. Virtual TeamSTEPS® simulations produce teamwork attitude changes among health professions students. *J Nurs Educ*. 2016 Jan;55(1):31-5. doi: 10.3928/01484834-20151214-08. PMID: 26812380.

120. Grumbach K, Becker SH, Osborn EH, et al. The challenge of defining and counting generalist physicians: an analysis of Physician Masterfile data. *Am J Public Health*. 1995 Oct;85(10):1402-7. doi: 10.2105/ajph.85.10.1402. PMID: 7573625.

121. Primary care workforce facts and stats. AHRQ Publication No. 12-P001-1-EF. Rockville, MD: Agency for Healthcare Research and Quality; 2012 [updated 2018]. <https://www.ahrq.gov/research/findings/factsheets/primary/pcworkforce/index.html>.
122. Schwartz MD, Basco WT, Grey MR, et al. Rekindling student interest in generalist careers. *Ann Intern Med.* 2005 Apr 19;142(8):715-24. doi: 10.7326/0003-4819-142-8-200504190-00040 %m 15838091. PMID: 15838091.
123. Song Z, Chopra V, McMahon LF, Jr. Addressing the primary care workforce crisis. *Am J Manag Care.* 2015 Aug;21(8):e452-e4. PMID: 26618225.
124. Loresto FL, Jr., Jupiter D, Kuo YF. Examining differences in characteristics between patients receiving primary care from nurse practitioners or physicians using Medicare Current Beneficiary Survey data and Medicare claims data. *J Am Assoc Nurse Pract.* 2017 Jun;29(6):340-7. doi: 10.1002/2327-6924.12465. PMID: 28544584.
125. Kuo YF, Chen NW, Baillargeon J, et al. Potentially preventable hospitalizations in Medicare patients with diabetes: a comparison of primary care provided by nurse practitioners versus physicians. *Med Care.* 2015 Sep;53(9):776-83. doi: 10.1097/mlr.0000000000000406. PMID: 26270826.
126. Poghosyan L, Liu J. Nurse practitioner autonomy and relationships with leadership affect teamwork in primary care practices: a cross-sectional survey. *J Gen Intern Med.* 2016 Jul;31(7):771-7. doi: 10.1007/s11606-016-3652-z. PMID: 26951282.
127. Poghosyan L, Liu J, Shang J, et al. Practice environments and job satisfaction and turnover intentions of nurse practitioners: Implications for primary care workforce capacity. *Health Care Manage Rev.* 2017 Apr/Jun;42(2):162-71. doi: 10.1097/hmr.0000000000000094. PMID: 26587998.
128. Poghosyan L, Norful AA, Liu J, et al. Nurse practitioner practice environments in primary care and quality of care for chronic diseases. *Med Care.* 2018 Sep;56(9):791-7. doi: 10.1097/mlr.0000000000000961. PMID: 30015724.
129. Poghosyan L, Liu J, Norful AA. Nurse practitioners as primary care providers with their own patient panels and organizational structures: A cross-sectional study. *Int J Nurs Stud.* 2017 Sep;74:1-7. doi: 10.1016/j.ijnurstu.2017.05.004. PMID: 28577459.
130. Hooker RS, Cawley JF, Everett CM. Predictive modeling the physician assistant supply: 2010-2025. *Public Health Rep.* 2011 Sep-Oct;126(5):708-16. doi: 10.1177/003335491112600513. PMID: 21886331.
131. Meyers D, LeRoy L, Bailit M, et al. Workforce configurations to provide high-quality, comprehensive primary care: a mixed-method exploration of staffing for four types of primary care practices. *J Gen Intern Med.* 2018 Oct;33(10):1774-9. doi: 10.1007/s11606-018-4530-7. PMID: 29971635.
132. New models of primary care workforce and financing. Case Example #7. Cherokee Health Systems. (Prepared by Abt Associates, in partnership with the MacColl Center for Health Care Innovation and Bailit Health Purchasing, Cambridge, MA, under Contract No.290-2010-00004-I/ 290-32009-T.) AHRQ Publication No. 16(17)-0046-7-EF. Rockville, MD: Agency for Healthcare Research and Quality; October 2016. https://www.ahrq.gov/sites/default/files/wysiwyg/professionals/systems/primary-care/workforce-financing/case_example_7.pdf.

133. New models of primary care workforce and financing. Executive summary. (Prepared by Abt Associates, in partnership with the MacColl Center for Health Care Innovation and Bailit Health Purchasing, Cambridge, MA, under Contract No.290-2010-00004-I/ 290-32009-T.). AHRQ Publication No. 16(17)-0046-9-EF. Rockville, MD: Agency for Healthcare Research and Quality; October 2016. https://www.ahrq.gov/sites/default/files/publications/files/workforce_executive_summary_0.pdf.
134. Bodenheimer T, Sinsky C. From triple to quadruple aim: care of the patient requires care of the provider. *Ann Fam Med*. 2014 Nov-Dec;12(6):573-6. doi: 10.1370/afm.1713. PMID: 25384822.
135. Buchbinder SB, Wilson M, Melick CF, et al. Primary care physician job satisfaction and turnover. *Am J Manag Care*. 2001 Jul;7(7):701-13. PMID: 11464428.
136. Rabatin J, Williams E, Baier Manwell L, et al. Predictors and outcomes of burnout in primary care physicians. *J Prim Care Community Health*. 2016 Jan;7(1):41-3. doi: 10.1177/2150131915607799. PMID: 26416697.
137. Kim LY, Rose DE, Soban LM, et al. Primary care tasks associated with provider burnout: findings from a Veterans Health Administration survey. *J Gen Intern Med*. 2018 Jan;33(1):50-6. doi: 10.1007/s11606-017-4188-6. PMID: 28948450.
138. Blechter B, Jiang N, Cleland C, et al. Correlates of burnout in small independent primary care practices in an urban setting. *J Am Board Fam Med*. 2018 Jul-Aug;31(4):529-36. doi: 10.3122/jabfm.2018.04.170360. PMID: 29986978.
139. Cuellar A, Krist AH, Nichols LM, et al. Effect of practice ownership on work environment, learning culture, psychological safety, and burnout. *Ann Fam Med*. 2018 Apr;16(Suppl 1):S44-S51. doi: 10.1370/afm.2198. PMID: 29632225.
140. Nocon RS, Fairchild PC, Gao Y, et al. Provider and staff morale, job satisfaction, and burnout over a 4-year medical home intervention. *J Gen Intern Med*. 2019 Jun;34(6):952-9. doi: 10.1007/s11606-019-04893-z. PMID: 30887431.
141. Nelson KM, Helfrich C, Sun H, et al. Implementation of the patient-centered medical home in the Veterans Health Administration: associations with patient satisfaction, quality of care, staff burnout, and hospital and emergency department use. *JAMA Intern Med*. 2014 Aug;174(8):1350-8. doi: 10.1001/jamainternmed.2014.2488. PMID: 25055197.
142. Linzer M, Baier Manwell L, Mundt M, et al. Organizational climate, stress, and error in primary care: the MEMO study. In: Henriksen K, Battles JB, Marks ES, Lewin DI, eds. *Advances in Patient Safety: From Research to Implementation (Volume 1: Research Findings)* Rockville, MD: Agency for Healthcare Research and Quality; 2005. <https://www.ncbi.nlm.nih.gov/books/NBK20448/>.
143. Perez HR, Beyrouty M, Bennett K, et al. Chaos in the clinic: Characteristics and consequences of practices perceived as chaotic. *J Healthc Qual*. 2017 Jan/Feb;39(1):43-53. doi: 10.1097/jhq.000000000000016. PMID: 26566238.
144. Kroth PJ, Morioka-Douglas N, Veres S, et al. The electronic elephant in the room: physicians and the electronic health record. *JAMIA Open*. 2018 Jul;1(1):49-56. doi: 10.1093/jamiaopen/ooy016. PMID: 31093606.

145. Kroth PJ, Morioka-Douglas N, Veres S, et al. Association of electronic health record design and use factors with clinician stress and burnout. *JAMA Netw Open*. 2019 Aug 2;2(8):e199609. doi: 10.1001/jamanetworkopen.2019.9609. PMID: 31418810.
146. Babbott S, Manwell LB, Brown R, et al. Electronic medical records and physician stress in primary care: results from the MEMO Study. *J Am Med Inform Assoc*. 2014 Feb;21(e1):e100-6. doi: 10.1136/amiajnl-2013-001875. PMID: 24005796.
147. Linzer M, Poplau S, Grossman E, et al. A cluster randomized trial of interventions to improve work conditions and clinician burnout in primary care: results from the Healthy Work Place (HWP) Study. *J Gen Intern Med*. 2015 Aug;30(8):1105-11. doi: 10.1007/s11606-015-3235-4. PMID: 25724571.
148. Linzer M, Levine R, Meltzer D, et al. 10 bold steps to prevent burnout in general internal medicine. *J Gen Intern Med*. 2014 Jan;29(1):18-20. doi: 10.1007/s11606-013-2597-8. PMID: 24002633.
149. Arora S, Thornton K, Jenkusky SM, et al. Project ECHO: linking university specialists with rural and prison-based clinicians to improve care for people with chronic hepatitis C in New Mexico. *Public Health Rep*. 2007;122(Suppl 2):74-7. doi: 10.1177/00333549071220s214. PMID: 17542458.
150. Zhou C, Crawford A, Serhal E, et al. The impact of Project ECHO on participant and patient outcomes: a systematic review. *Acad Med*. 2016 Oct;91(10):1439-61. doi: 10.1097/acm.0000000000001328. PMID: 27489018.
151. McBain RK, Sousa JL, Rose AJ, et al. Impact of Project ECHO models of medical tele-education: a systematic review. *J Gen Intern Med*. 2019 Dec;34(12):2842-57. doi: 10.1007/s11606-019-05291-1. PMID: 31485970.
152. Hager B, Hasselberg M, Arzubi E, et al. Leveraging behavioral health expertise: practices and potential of the Project ECHO approach to virtually integrating care in underserved areas. *Psychiatr Serv*. 2018 Apr;69(4):366-9. doi: 10.1176/appi.ps.201700211. PMID: 29446334.
153. Willig JH, Krawitz M, Panjamapirom A, et al. Closing the feedback loop: an interactive voice response system to provide follow-up and feedback in primary care settings. *J Med Syst*. 2013 Apr;37(2):9905. doi: 10.1007/s10916-012-9905-4. PMID: 23340825.
154. Reed ME, Huang J, Graetz I, et al. Patient characteristics associated with choosing a telemedicine visit vs office visit with the same primary care clinicians. *JAMA Netw Open*. 2020 Jun;3(6):e205873. doi: 10.1001/jamanetworkopen.2020.5873. PMID: 32585018.
155. Carayon P, Karsh B-T, Cartmill R, et al. Incorporating health information technology into workflow redesign--Summary report. (Prepared by the Center for Quality and Productivity Improvement, University of Wisconsin--Madison, under Contract No. HHS 290-2008-10036C). AHRQ Publication No. 10-0098-EF. Rockville, MD: Agency for Healthcare Research and Quality; October 2010. <https://digital.ahrq.gov/sites/default/files/docs/citation/workflowsummaryreport.pdf>.
156. Simon SR, Kaushal R, Cleary PD, et al. Physicians and electronic health records: a statewide survey. *Arch Intern Med*. 2007 Mar 12;167(5):507-12. doi: 10.1001/archinte.167.5.507. PMID: 17353500.
157. Kuhn K, Warren J, Leong T-Y. MEDINFO 2007: Proceedings of the 12th World Congress on Health (Medical) Informatics - Building Sustainable Health Systems.; 2007.

158. Goroll AH, Simon SR, Tripathi M, et al. Community-wide implementation of health information technology: the Massachusetts eHealth Collaborative experience. *J Am Med Inform Assoc.* 2009 Jan-Feb;16(1):132-9. doi: 10.1197/jamia.M2899. PMID: 18952937.
159. Valuck RJ, Anderson HO, Libby AM, et al. Enhancing electronic health record measurement of depression severity and suicide ideation: a Distributed Ambulatory Research in Therapeutics Network (DARTNet) study. *J Am Board Fam Med.* 2012 Sep-Oct;25(5):582-93. doi: 10.3122/jabfm.2012.05.110053. PMID: 22956694.
160. Krist AH, Peele E, Woolf SH, et al. Designing a patient-centered personal health record to promote preventive care. *BMC Med Inform Decis Mak.* 2011 Nov 24;11:73. doi: 10.1186/1472-6947-11-73. PMID: 22115059.
161. Chrischilles EA, Hourcade JP, Doucette W, et al. Personal health records: a randomized trial of effects on elder medication safety. *J Am Med Inform Assoc.* 2014 Jul-Aug;21(4):679-86. doi: 10.1136/amiajnl-2013-002284. PMID: 24326536.
162. Lau F, Kuziemsky C, eds. *Handbook of eHealth Evaluation: An Evidence-based Approach.* Victoria, BC: University of Victoria; 2017.
163. Cifuentes M, Davis M, Fernald D, et al. Electronic health record challenges, workarounds, and solutions observed in practices integrating behavioral health and primary care. *J Am Board Fam Med.* 2015 Sep-Oct;28(Suppl 1):S63-72. doi: 10.3122/jabfm.2015.S1.150133. PMID: 26359473.
164. Berner E, Berner ES. *Clinical decision support systems: State of the Art.* AHRQ Publication No. 09-0069-EF. Rockville, MD: Agency for Healthcare Research and Quality; June 2009. https://digital.ahrq.gov/sites/default/files/docs/page/09-0069-EF_1.pdf.
165. Karsh B-T. *Clinical practice improvement and redesign: how change in workflow can be supported by clinical decision support.* AHRQ Publication No. 09-0054-EF. Rockville, MD: Agency for Healthcare Research and Quality; June 2009. https://digital.ahrq.gov/sites/default/files/docs/biblio/09-0054-EF-Updated_0.pdf.
166. Kawamoto K, Houlihan CA, Balas EA, et al. Improving clinical practice using clinical decision support systems: a systematic review of trials to identify features critical to success. *BMJ.* 2005 Apr 2;330(7494):765. doi: 10.1136/bmj.38398.500764.8F. PMID: 15767266.
167. Eichner J, Das M. *Challenges and barriers to clinical decision support (CDS) design and implementation experienced in the Agency for Healthcare Research and Quality CDS demonstrations.* (Prepared for the AHRQ National Resource Center for Health Information Technology under Contract No. 290-04-0016.). AHRQ Publication No. 10-0064-EF. Rockville, MD: Agency for Healthcare Research and Quality; March 2010. https://digital.ahrq.gov/sites/default/files/docs/page/CDS_challenges_and_barriers.pdf.
168. Raetzman S, Sordo M, Osheroff J, et al. *Structuring care recommendations for clinical decision support: background assessment, synthesis, and methods report.* (Prepared by Thomson Reuters under Contract No. HHS 290-2009-000221.). AHRQ Publication No. 11-0025-1-EF. Rockville, MD: Agency for Healthcare Research and Quality; March 2011. https://digital.ahrq.gov/sites/default/files/docs/citation/structuring_care_recommendations_for_clinical_decision_support_background_assessment_synthesis_and_methods_report.pdf.

169. Raetzman SO, Osheroff J, Greenes RA, et al. Structuring care recommendations for clinical decision support - Final report. (Prepared by Thomson Reuters under Contract No. 290-09-00022I-2). AHRQ Publication No. 11-0025-2-EF. Rockville, MD: Agency for Healthcare Research and Quality; September 2011.
<https://digital.ahrq.gov/sites/default/files/docs/citation/SCRCDS%2520FINAL%2520SUMMARY%2520REPORT.pdf>
170. Ravikumar KE, MacLaughlin KL, Scheitel MR, et al. Improving the accuracy of a clinical decision support system for cervical cancer screening and surveillance. *Appl Clin Inform*. 2018 Jan;9(1):62-71. doi: 10.1055/s-0037-1617451. PMID: 29365341.
171. Borsky A, Zhan C, Miller T, et al. Few Americans receive all high-priority, appropriate clinical preventive services. *Health Aff*. 2018 Jun;37(6):925-8. doi: 10.1377/hlthaff.2017.1248. PMID: 29863918.
172. Bryant KB, Green MB, Shimbo D, et al. Home blood pressure monitoring for hypertension diagnosis by current recommendations: a long way to go. *Hypertension*. 2022 Feb;79(2):e15-e7. doi: 10.1161/hypertensionaha.121.18463. PMID: 34852639.
173. O'Leary K, Tanghe D, Pratt W, et al. Collaborative health reminders and notifications: insights from prototypes. *AMIA Annu Symp Proc*. 2018 Dec 5;2018:837-46. PMID: 30815126.
174. Harris SK, Aalsma MC, Weitzman ER, et al. Research on clinical preventive services for adolescents and young adults: where are we and where do we need to go? *J Adolesc Health*. 2017 Mar;60(3):249-60. doi: 10.1016/j.jadohealth.2016.10.005. PMID: 28011064.
175. Epling JW, Borsky AE, Gerteis J. Improvements to the US Preventive Services Task Force recommendation statement. *JAMA*. 2019 Sep 24;322(12):1143-4. doi: 10.1001/jama.2019.11311. PMID: 31550039.
176. Romaine MA. Use of primary care and specialty providers: findings from the Medical Expenditure Panel Survey. *J Gen Intern Med*. 2020 Jul;35(7):2003-9. doi: 10.1007/s11606-020-05773-7. PMID: 32291713.

Appendix A. Grants Database Search Terms & Analytic Categories/Definitions used in Portfolio Analysis 2008-2019

Search Terms

Primary (945) // PBRN (5 w/out primary), PCMH//Patient centered medical home (14 PCMH only w/out primary; 6 w/out primary spelled out only), FQHC (2 w/out primary), community health (47 w/out primary), care transition (16 w/out primary)/coordination (56 w/out primary), screening (146 w/out primary), community based w/out primary (24), ambulatory w/out primary (134)

Setting

Inclusion: Primary care settings (clinic, office, networks), FQHC, Across Healthcare system, Community Health Centre (CHC), Long-term care facility, Integrated Delivery Network (IDN), VA Medical Center, Free clinic, Behavioral health clinic (BHC), not-specified, PCMH, PBRN, Ambulatory (outpatient – in primary care setting),

Exclusion: Ambulatory inpatient/hospital related, Hospital (inpatient), Academic Medical Center, ED, Perioperative/operative, ICU, Ambulatory Surgical Center, Lab, Pharm, Rehab center, Home care, nursing home (unless interact with PC setting), hospice (unless interact with PC setting), Dental office

Workforce

Inclusion: Clinical staff (general), Physician (general), caregiver, nurse, PA, NP, Clinical Health Worker (CHW), Pt Navigator, Social Worker

Exclusion: Researcher, surgeon, decision maker, IT staff, stakeholder, vendor, Admin, PH worker, Dentist, Pharmacist

Variables

- **# Distinct institutions:**
- **# States (distribution):**
- **# Invested in total grants and contracts:**
- **\$\$ Amount Funded:**
- **% Funds to X: (where X are themes or variables we want to call attention to)**
- **Kind of Intervention/Program:**
 - Conference
 - Research
 - Collaboration
- **If research, Research Focus:**
 - Intervention: Implementing, testing, or piloting an intervention to change or improve the way primary care is delivered
 - Data Analysis: Research focused on analysis of existing data sets
 - Measure Development: Development or testing the usability or validity of a proposed measure of care
 - Methods Development: Developing, testing, refining research methods
 - Exploratory: Research to describe a care context or issue preliminary to developing an intervention

- N/A

Populations

Age Studied (Did the abstract/SS indicate that the work described would have impact on, involve, or study the following age groups?): PEDS (Infant, children, pediatric setting), Adolescent (13-17 years old, teen), Young Adult (18-25 years old), Adult (25-65 years old), Elderly (65+ years old), None indicated

Coverage (Did the abstract/SS indicate that the work described would have impact on, involve, or leverage the following insured/insurance populations?): Medicare, Medicaid, Private Insurance, Uninsured, Veterans (VHA), None indicated

Race/ethnicity (Did the abstract/SS indicate that the work described would have impact on, involve, or study the following racial or ethnic groups?): Black/African American, Hispanic/Latino, Native American/Alaska Native, Asian, Pacific Islander, White, Race/ethnicity (not-specified): [when race/ethnicity mentioned as a population but is not stratified], None indicated

Vulnerable populations (Did the abstract/SS indicate that the work described would have impact on, involve, or study the following vulnerable groups/populations?):

- Minorities: minority racial/ethnic group regardless of if that group is specifically identified or not
- Low income: low income or poor populations or populations that primarily use FQHCs
- Underserved: mentions (in text) “underserved” communities, locations, or populations.
- Disabilities: physical or mental disabilities
- Low literacy: mentions (in text) “low literacy”, addresses literacy in health populations, or language barriers in relation to health access or care
- Special healthcare needs: healthcare and needs of children with chronic physical, developmental, behavioral, or emotional conditions. Requires extra medical management, intervention, and/or use of specialized services/programs
- Trans: transgender or transexual
- LGB: lesbian, gay, bisexual
- other (gender ID): people who identify as a gender discordant with their biological sex
- Vulnerable (non-specific): when vulnerable populations mentioned but not stratified
- None indicated

Geography (Did the abstract/SS indicate that the work described would have impact on, involve, or study populations the following geographical locations?): Urban/inner city, rural, suburban, None indicated

Medical Conditions studied

Chronic Disease (Did the abstract/SS indicate that the work described would have impact on, involve, or study the following conditions? Does not include screening):

- Arthritis/joint disorders: Arthritis, Rheumatoid arthritis, Osteoarthritis
- Asthma: child and adult
- CVD: HTN, CAD, CHF, PAD, stroke
- Diabetes
- Obesity: beyond being overweight
- GI disorder: reflux, peptic ulcer
- other (): includes depression, cancer (breast, colon, cervical, penile, kidney, lung, prostate), dementia, COPD, lung disease, thromboembolic, chronic pain, opioids, substance abuse,

Alzheimer's, Sickle Cell, headaches/seizures, Dyslipidemia-hyperlipidemia, hyperglycemia, peripheral neuropathy, schizophrenia, HIV, HCV, allergies, etc

- other (cancer, general), other (mental, general), other (Dyslipidemia, general): general – these did not specify what the specific condition(s) was/were.
- other (undefined): general impact on a chronic disease mentioned
- other (multiple): worded as co-occurring multiple chronic disorders but did not specify (MCC)
- None indicated

MCC (Y/N): defined as more than one co-occurring/comorbid chronic condition; does not include mental health*

Mental/behavioral health (Y/N) defined as depression, anxiety, behavioral changes – ex. changing drug abuse behavior or exercise/diet, includes mental health disorders or conditions, includes neurological disorders or conditions

Cancer: (Y/N) defined as Cancer (unspecified), Breast Cancer, Cervical Cancer (HPV), Lung Cancer, Prostate Cancer, Skin Cancer, Penile Cancer, Kidney Cancer – Includes screening

Infectious Disease: (Y/N) defined as HIV/AIDS, HCV, HPV, any other bacteria/fungal/viral infection

Women's Health Issues: (Y/N) defined as Contraception, well woman exams, cervical cancer screening, breast cancer screening, pregnancy, prenatal, breast feeding

Prevention (Y/N): defined as Immunizations, Screening, Tobacco use, Substance use, behavioral counseling, preventative medications (aspirin, statins), diet, exercise, safety

Healthcare Themes

Clinical Decision-making (Y/N) defined as Decision support tools or processes that processes/organizes/prioritizes information (pt or general) allow a clinician to make a care decision at the moment/point of care. Includes shared decision-making with the patient. These tools or processes may interpret or integrate evidence/data and be integral in suggesting next steps for treatment, alerting providers, catching potential problems (med interaction). Includes: computerized alerts/reminders to clinicians or patients; integration of clinical guidelines into best-practice alerts or processes; condition specific order sets; focused pt data reports/summaries; documentation templates; dx support; contextually relevant reference info. Excludes: practice facilitation

Medication management and adherence (Y/N) defined as System or workflow intended to ensure that patients are on the correct medications (i.e. reconciliation), to help pts stay on their medication, or reduce incidence of missing a dose.

PHC transformation (Y/N) defined as fundamentally changing how care is delivered and/or creating the infrastructure needed to transform care at a location, in a HC system, or in a network/region. This often includes system-wide changes to PHC delivery that is often associated with the creation/shift to/transformation of practices into PCMHs, ACOs, or some other kind of medical home care structure. Includes: understanding changes/process of transformation into a medical home, creating/supporting/maintaining infrastructure for PC transformation (IMPACT), state level initiatives that provide QI infrastructure for transformation, and estimating costs of transformation.

Care Management [Coordination/Transitions in Care] (Y/N) defined as people or processes in the workflow who/that are needed to ensure continuity of care such as navigator or social worker; includes

technology or processes that help pts move through healthcare system/providers; chronic disease management and education. Needs to reference “who” is involved in management of care

Cost or Payment Schema (Y/N) defined as a grant that either deals with cost of implementation, payment bundling, or how pts will have to pay for care

Primary Care Models: Y(PCMH), Y(other), N defined as referencing the whole practice; either PCMH, Primary Care First (PCF), Direct Contracting (DC), Direct Primary Care model. Excludes: Chronic Care Model, ACO










PBRN (Y/N) defined as Network of researchers and clinicians in primary care that help enhance best practices

Quality Improvement (Y/N) defined as a systematic and continuous process(es) – not just doing something that will improve care in the future. Systemic formal approach to analysis of practice improvement and efforts to improve performance. Includes: PDSAs, LEAN, Six Sigma

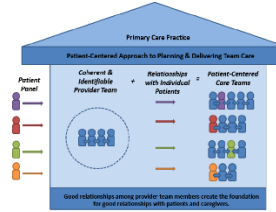
Leveraging HIT (Y/N) defined as using health information technology to enhance, improve, or build on a process; or technology used to help manage pts/increase pt stake in care

Dissemination and Implementation (Y/N) defined as a grant that is implementing or disseminating an established protocol, novel intervention, or proven work **AND** which collects data **on/studies the process of that dissemination/implementation activity – Includes:** Barriers/facilitators to adopting a process. Excludes: standard conferences or support of something that would be implemented

Appendix B. Timeline: Examples of AHRQ's Primary Care Research Investments

1996	Medical Expenditure Panel Survey (MEPS)	
1999	Self-Management	
2000	Practice-Based Research Networks (PBRNs)	
2000	Clinician Burnout work	
2003	National Healthcare Disparities Report	
2004	Project ECHO	
2007-2013	Ambulatory Safety and Quality Program	
2008	CAHPS-Adult Primary Care and Child Primary Care; CG-CAHPS	
2008	Behavioral Health Integration The Academy for Integrating Behavioral Health and Primary Care	
2008-2010	Multiple Chronic Conditions grants MCC Research Network	
2010	Transforming Primary Care grants	
2011	IMPACT grants	

2011 Team-Based Care



2012 TeamSTEPPS Primary Care



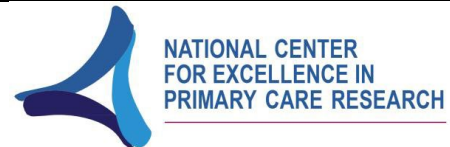
2013 Estimating Costs of Primary Care Transformation grants

2013 SHARE Approach

2014 CUSP Primary Care



2014 National Center for Excellence in Primary Care Research



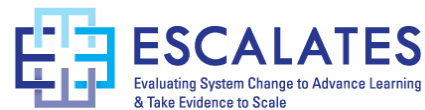
2015 Six Building Blocks



2015 EvidenceNOW: Advancing Heart Health



2015 ESCALATES



2019 EvidenceNOW: Managing Unhealthy Alcohol Use





Publication No. 24-0016
January 2024
www.ahrq.gov